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ABSTRACT

This booklet is the twelfth of a series of 16 booklets that together describe and present findings for a study which involved field observations and a survey of science teaching and learning in American public schools during the school year 1976-77. The study was undertaken to provide the National Science Foundation with a portrayal of current conditions in K-12 science classrooms to help make the Foundation's programs of support for science education consistent with national needs. Eleven high schools and their feeder schools were selected to provide a diverse and balanced group of case study sites. One field researcher was assigned to each site and instructed to find out what was happening and what was felt important in science (including mathematics and social science) programs. The case study report from the "Greater Boston" site is contained in this booklet. (MN)

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Booklet XI
Case Studies in Science Education: Boston
Rob Walker

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270 Education Building
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BOOKLET XI

CASE STUDIES IN SCIENCE EDUCATION:

GREATER BOSTON

Rob Walker
CARE
University of East Anglia
Norwich, England

April 1977

"It's difficult to describe something to someone who has never been there."

(Dick Gregory in the film Chicago Blues)

"The Commonwealth requires the education of the People as the safeguard of order and liberty"

(Inscribed over the Boston Public Library)

Britisher Rob Walker has managed to challenge seriously three of my pet assumptions in one fell case study. My guess is he will do as well or better with other readers of this penetrating study of science instruction in an urban high school.

As a parent raised in Detroit, a parent who tried unsuccessfully a decade ago to cope with a son's terror-filled life in a large east coast secondary school, I am encouraged to learn of an urban high school which does not fit an image developed over two generations.

Further, as a case study writer who was taught his trade in the Meredith Wilson school of ethnography, I am now dubious about our first principle, "You gotta know the territory." Rob Walker shows what intelligence, skillful interviewing, meticulous observation and dogged tenacity can do to overcome his outsider's handicap.

Finally, I am much more open to the concept of a magnet school as a result of Walker's work. Heretofore, the magnet school was grouped in my mind with other such feckless products of the modern educational industry as change agents, product champions, experimental schools and career education.

What I am left with is a strong case for the probable existence of an urban high school which honors academic interests, one that draws multiracial talent from many sectors of the city. Mr. Walker's keen eye and writing skill are revealed in the tale that follows, one which will both establish his eminence as a nonpareil recorder of educational practice and enhance our understanding of the instructional realities of urban high schools.

Terry Denny

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CASE STUDIES IN SCIENCE EDUCATION:
GREATER BOSTON

Rob Walker

UP IN THE MORNING AND OFF TO SCHOOL

Seven ten a.m., and after a hurried breakfast Pete finds himself out of the house and driving his traffic-scarred car towards school. He has to start early so that he can sign in before 7:30, fifteen minutes before homeroom.

There are no direct highways to the school, and the city is noted for its elaborate, and often antiquated, road system. (Local legend has it that the roads follow what were once cow tracks.) Strangers to the city spend much of their traveling time lost or disorientated. Pete's route is well-worn and familiar, but nevertheless he spends much of the journey sitting at lights, waiting to turn into traffic, or inching along what a little later in the morning will become a major traffic holdup.

It's a frustrating start to the morning. Pete frequently finds himself cursing the driver in front who won't stay in lane, or the car that blocks the turn-left arrow at the lights. A cyclist pulls sharply across in front of him at an intersection, causing him to brake suddenly. Pete leaps out of the car, grabs the small black kid by the coat and shouts at him. The boy hangs his head and mutters an apology. Two hours later Pete confesses to some of the teachers in the teachers' lounge that he feels bad about the incident and that he surprised himself at his instant aggressive response. But it is an incident that haunts him the rest of the day, and later that night he depresses himself thinking again about his time in Vietnam. Back in the car he consoles himself with the thought that the teachers who live out in the suburbs leave home half an hour earlier, and suffer more from traffic holdups and bad weather. The banks of frozen snow at the side of the road are a reminder that at any time the weather can make the drive more hazardous and double the time it takes.

The traffic is worst within two blocks of school. As he follows an ancient tramcar that always reminds him of those movies about wartime Poland, the front wheel of the car drops into a deep hole in the road, sending a shudder through the front suspension. It is with a sense of relief that he finally turns off the main road into the area surrounding the school.

The morning news on the radio continues its daily narrative of wheeling and dealing in city politics, and the view through the windscreen adds its own commentary to the story. This is a city dominated by public institutions. Fifty universities, another hundred colleges of various kinds, several major hospitals, the world headquarters of a major church, a score of nationally-known museums and galleries, and one of America's finest symphony orchestras. Within a quarter-mile radius of the school, which occupies a new ten-floor building on a restricted site, are three large hospitals, four or five colleges, and the city's most prestigious (examination entry) high school. It is an area where people work, not one where they live, and the work they do is over-whelmingly that of a service economy: teachers, students, doctors, nurses, and a minor army of custodial staff, security men and cleaners. Parking is a nightmare.

The radio interviewer is talking to an economist about the overall state of city finances. The economist is saying:

> *Culturally, this is a rich city; but partly because of that, its tax base is sadly depleted. We've no major industry here, no natural resources, no cheap supply of energy. We may be a national centre culturally speaking, but in economic terms we're really only a regional centre. Compared to the other great American cities, we're poor and getting poorer. Everyone talks about New York city going bankrupt, but New York has seen a period of economic growth we've never seen. We're perhaps the last of the great old American cities: an immigrant city the poor pass through on their way to better things, and if they don't pass through they just get left behind. It costs a lot to keep this city going. Look at the schools. it costs twice as much per high school student in the city compared to the rest of the state, an average cost that actually gets greater per student as numbers in the schools decline. With 55% of the city tax-exempt, we are rapidly reaching the point where we have to decide whether or not we want to maintain life in the city at even its present rather low ebb. It's like the decision you have with a coma patient. At what point do you withdraw life support systems?*

The interviewer seems taken aback by this uncharacteristic outburst. Floundering for a question, she asks, "Do you think there is any chance of things getting better?" "That's not the question," the economist replies; "The question is, how much worse is it going to get?"

Pete's car runs down the slope into the school's underground car park and the concrete walls shut out the radio signal. "Oh well," he sighs out loud to himself, "another start to another day."

ANOTHER START; ANOTHER DAY

After they sign in and collect their mail from the first floor office, first stop for most teachers is the teachers' lounge on the fifth floor. Selecting a key from the twenty or more most teachers carry, Pete summons the elevator. Most students use the escalators; but as the elevator door opens, a girl with crutches and a leg bandage emerges. Handicapped students are quite common in school, but as the elevator travels upward one of the teachers jokes, "You know I'm sure some of these students just carry crutches to ride the elevator."

At the fifth floor there's a rush for the teachers' lounge. Promptly at 7:30 the door to the coffee urn closes ("Otherwise we'd never get the teachers into homeroom," explained an administrator). Pete passes his head of department; "How's life in your lily-white suburb?" he asks. Bill has been teaching in the city long enough to have seen everything at least once before. "Your turn will come," he says. "Never, never," says Pete emphatically. "You think not?" comes the knowing reply.

Being a new school it invites criticism from its inhabitants ("an architect's dream and a teachers' nightmare"). Whatever the complaints, it's an interesting thing about the school that once inside, you lose much sense of what lies outside. It's one of those things that is so obvious to all the teachers that they have long since ceased to question it. The only people you ever see staring out of the windows are visitors, unless there is a baseball game being played (the scoreboard faces the school). Pete feels it not so much an architectural feature of the school but a feeling of belonging, of familiarity and recognition. Once inside school, he feels secure; he likes to be there. Enough teachers feel the same way that it is not something they need to talk about, or feel the need to hide.

To someone whose image of an inner city school is one of hostility or human desolation, it no doube seems strange that a good many of the teachers, and some students, feel at home here. Teachers who have been here for some time say it has always been like that, partly because for many years this has been a school that took students on a city-wide basis. Even when, in the late sixties, it became a predominantly black school, it was never really a neighbourhood school like many other high schools in the city. It seems the circle of colleges and hospitals that surround the school have effectively insulated it from the streets where students live.

From the interaction of architecture and organisational history has arisen a distinctive psychological ecology. Pete has noticed that only very rarely do people pin things on walls or bulletin boards (the main exception being administrative or guidance offices; few classrooms or teachers' rooms are so decorated). In a lot of places people have drawn the curtains across the windows and leave the lights on all day. Perhaps initially they do so to reduce the glare from the winter sun; but often once they are closed, they leave them that way. After a while you take these things for granted.

Like hospital or prison, you might think; being inside. But no, Pete would say, there is a difference between being closed in and being shut in. "I like it here, I like being in my classroom. I like the kids. The other day I was sitting in my classroom; just sitting watching the students and someone came in and said, 'What are you doing? Do you feel alright?' And I said, 'Sure, I'm just watching my class.' I think he thought I was crazy." Perhaps surprisingly, this is the kind of thing you hear quite a lot amongst the teachers. Bill, the head of science says, more than half seriously, "When I want to relax, I shut myself in my room with a class of students." It seems there are enough teachers in the school who are concerned and committed, and above all who <u>like</u> teaching, that such a confession isn't just a joke. A major source of motivation for many teachers is not altruism, idealism or even the desire to educate, but simply their enjoyment of the social contact, with students and other teachers, that the school provides.

Whatever outside commentators may say about the state of the city, and the state of education in the city, inside the school it is difficult to detect any feeling that things are getting worse. In fact, given the turmoil of the last ten years, most people seem to feel it is a remarkable accident that the school is here at all; a circumstance akin to the origins of life on earth, one science teacher suggested. This is not to say there are no problems, but it does seem that few people feel that the problems are unmanageable or out of control. In the words of the principal, referring to the turmoil of the past decade: "I think we've turned the situation around."

Attendance remains a major problem, and one that consumes considerable personal and organisational energy. According to the figures, attendance is about 70%; but this statistic disguises considerable tardiness and some cutting of classes. Yet you don't have to be in the school long to realise that whatever the attendance figure is, it is high. If you were to replace the curriculum with more traditional courses, withdraw the concern and care of the teachers, and above all take away the joking and humour that many students meet from their teachers and from the aides, that percentage would certainly fall, and perhaps dramatically.

The school administration works hard on the absence/tardiness problem, and most teachers do what they can: scolding, cajoling, encouraging. As Pete walks down the corridor to his room, he passes a girl he hasn't seen for some time. "Well Hi, Janice, great to have you back. How was Florida? You mean you didn't to go Florida? Where was it then? Bermuda? Oh those beaches and the palms! Don't tell me you've been in Buffalo with a suntan like that?" The pale-skinned girl smiles and blushes and walks on. She's going to meet a lot of such attention today and a group of friends hang around her, partly in support, but also because they enjoy being part of the scene.

Monday morning, first period. It's not difficult to find classes half full. Some of the students are no doubt in the building or on their way to school, but teachers long ago accepted that continuity from class to class was problematic. They have got used to overlapping the course from class to class; to reviewing and repeating, to falling behind on plans that are too ambitious and to thinking ahead only one lesson at a time. But when you look again, what is surprising is not how many students are absent, but how many have turned up. The students who have been working all weekend, and in some cases all night. Those from crowded homes or housing conditions where getting sleep is always a problem. The pregnant girl still suffering from morning sickness. The kids who are popping pills. The black boy who feels that school must have something to offer, but still can't see what it is. (In a rare cynical moment a history teacher said to Pete, "Perhaps he was the one the Civil Rights movement was for. Or maybe he was just the victim.") If the school's efforts to keep attendance up were merely oppressive, a lot of the students who are coming, wouldn't. "It's a difficult line to draw," explains one senior teacher, "between wanting them here and making them stay."

Whatever the feeling in the city as a whole, for the school there is little sign of things about to get worse. Perhaps three years ago people felt that way, but not now. Most teachers feel confident that they can at least hold the situation at its present level, and some are hopeful that significant improvements can be made in terms of curriculum and teaching. Those in more experimental programmes (like the Reading Lab) are more immediately aware of imminent financial cuts and the effects of the school board's use of output measures to assess the efficienty of schooling, but most teachers remain unaffected.

Why the school feels itself to a large extent autonomous and not really an integral part of the city school system is not puzzling when you know its recent history. The legacy that remains from three years of court-ordered desegregation is virtually a total lack of confidence in the central office administration and the school board. ("The Judge runs the schools," was how one central office employee put it.) The school feels it has been left to cope with situations not of its own making, that decisions have frequently been taken on political grounds without reference to what happens in schools. The teachers have learned to cope and to expect little in the way of help from outside; and the effect of that has been at best independence, and sometimes suspicion, of agencies beyond the school, and a deep antipathy to the very middle class suburbs where many teachers live. The exception has been in contacts with higher educational institutions. Thanks to a large input of effort on both sides, some of the links with teacher education colleges, and with various colleges participating in the magnet scheme, seem strong and even productive.

Loss of confidence in the central administration of the school system on the part of many teachers is one reason why the school feels autonomous. A complex feeder pattern, which means the school has few close links with other schools in the system, is another. An important consequence has been that the school appears to have set its own limits and its own targets; few fingers of blame are pointed at the outside world. Teachers may express cynicism at the politicking of the school board and the superintendent's office, and they will point to the home and family circumstances of the students as prior conditions of schooling. But for the most part, such references are in the nature of comments rather than explanations or excuses. Like many of the other teachers, Pete feels that if you teach in the school you have to accept these things for what they are; but once in the classroom, you have to confine yourself to the problems of the moment. Judging from what people say, this seems a change from the late sixties, when all problems were seen primarily as problems external to the school, and virtually beyond control.

"Things have changed a lot since the sixties," one long-established teacher says. "Everyone talks about how much the students have changed, but the teachers have changed, too. Everyone is more realistic about what is possible - but don't get me wrong, they are not necessarily less idealistic. It's just that they are not about to burn themselves out on one dramatic and possibly futile event."

Writing about the city's failure to agree on charter reforms that would allow some minority representation on the school board, the morning newspaper had despaired at this "city that is changing, but has not yet changed." Change is certainly easy to detect in the context of the school, even though there is currently a feeling of life settling down to some kind of pattern. The guidance counsellor, who has been at the school throughout the last decade, emphasised this view:

> *In the sixties we lived through a difficult period. At the time of student unrest in the universities we had the SDS and the Black Panthers in the school, both fairly determined to overturn it. The idea was, apparently, that if this school was to go, then the whole system would crumble. We survived that, interestingly, because of the support we got from the majority of the students; but we survived it only to run straight into desegregation, busing, the courts virtually running the schools. Actually we came out of that quite well; this was a black school that came out of busing well, and if the courts hadn't stepped in, the school board would probably have shut the school down. But still, day-to-day in the halls and the classrooms it was a trying period and not without tension. Now it seems there's been another, perhaps more subtle change. The students seem to know more what they want from school, and also what they can expect, and perhaps that's true of the teachers, too. I'd say there's less fervour and more hard work going on in the building than there was a few years ago. The changes we've seen in the economy seem to have made their biggest impact on education; certainly the change of job prospects seems to be having quite a profound effect on students' attitudes and values. Of course we still have enormous problems, but the school seems less volatile, more stable, than it has done for years.*

Not everyone would share his view. One young teacher told one of the site visitors that she thought racial tensions in the school were only just being contained and she clearly felt that conflict was imminent. Yet overall, considering the circumstances, it seemed to me that morale was high. The predominant mood of human contact (whether teacher-student or student-teacher) is humour with the mock insult as the preferred form; a mood that can only survive under circumstances of some mutual trust.

CONVERSATION IN THE TEACHERS' LOUNGE

Pete's a young teacher, and may not be typical. The school does, though, receive a large number of visitors, and I asked some of them what were the things they noticed. One of the things that often strikes visitors to the school is the nature of conversation in the teachers' lounge. Most people, most of the time, it seems, are talking about teaching. Not carping or complaining, but <u>discussing</u> teaching, the students or the subjects they teach. As a regular visitor I found myself looking forward to going into school simply for the conversation. People talked to me about the school, city politics, their childhood in the city, the merits of Rudyard Kipling as a writer, tree ring dating, germ warfare, sun spot activity, the origins of Indo-European languages, the brilliance of Tom Stoppard, a recent Symphony concert, how last year they cycled to California, the Maine desert, gas chromotography, French opera, tectonic plates; a verbal encyclopedia of topics. Sometimes I wondered if it was something about me, so I'd sit quiet and listen to what others were saying, but it would be the same all around the room. Often I'd find myself wondering at the educational resources contained in that room.

Of course many teachers avoided the room, and some spent more time there than others, but that doesn't alter the fact that the tone and climate of the place was unusual. Physically it is not a very comfortable, attractive or welcoming place, and some teachers preferred to find other niches in which to relax. Others get too busy. One young teacher told me he avoided the place because he liked to read, adding, "I don't want to become one of those teachers who comes into class, puts some page numbers on the board and spends the

lesson reading the newspaper. If I can't be a good teacher, I'll go and do something else. Life's too short to spend time as a mediocre teacher." Such single-minded dedication is, however, unusual, and most teachers spent some time each day in the lounge.

In this section I want to use some teachers' lounge conversations as a lead into what seem to me significant educational issues. At the end I'll return again to the room itself and say something about that.

Conversation 1
The Role of the Experiment in Science Teaching

Steve: *(Looking through a workbook of experiments David has been using in his class) The trouble with a lot of this stuff is that it is so obvious. Even when you have done the experiment, you only know what you knew already.*

David: *Maybe it's obvious to you, but it isn't always obvious to these kids. To some of them maybe, but not to all of them. Sometimes they do know what is going to happen in the experiment, but they only know it vaguely; they haven't really thought it out.*

Like this morning we were talking about that experiment where you float a cork in water, then push an upturned glass down on top of it. They did the experiment and saw what happened. When I asked why the cork went down, one girl just said "gravity." Well, you can see what she means; it does involve gravity, but that's not an explanation of what you see happening.

Steve: *Yes, but you can't say that's exciting, Floating corks in water. I want to get these kids interested in science. I want experiments you can do which set them all off saying, "Wow! How did that happen?" Something that really challenges and excites them.*

(Looking at the book) Finding out 20% of the air is oxygen. That's no challenge. Why not just tell them. You shouldn't just have to do an experiment for everything, only if it excites them or triggers them off.

David: *But before you can work on these dramatic experiments they have got to know scientific procedures and appreciate the methods. All this week I've been emphasising the five stages of writing a lab report and getting them to appreciate the difference between observation and explanation. Those are not things you can just tell anybody. You have to do it several times and it takes practice. And for most of them, writing a scientific report is not something they are used to doing; in fact some of them have got so used to multiple choice tests that it is an effort for them to write complete sentences.*

Steve: *Maybe you are right. I think teaching them rigour and method is a useful thing to do. The danger, though, is that you end up just pacifying them. The science that is going to affect their lives isn't the five stages of writing a lab report. It is nuclear power, pollution, recombinant DNA research. Those are the things I want them to know about, and I want them to be able to pursue things for themselves, not just because they are in a course or a textbook.*

This conversational fragment takes us immediately into a number of crucial science education issues.

What is the nature of science? Is it new ways of looking at things we usually take for granted, or is knowledge at new frontiers? Is it methodical, disciplined and perhaps sometimes boring; or is it imaginative, free-wheeling and perhaps sometimes incoherent?

What part should experimentation play in science teaching? Is science primarily theoretical?

What part should applied science, and the applications of science, play in the school science curriculum? Should science teaching start from the applications and only work back to the theory when necessary and as far as necessary?

Or should understanding of applications come only on the basis of theory, as a pinnacle (or afterthought)?

What part should social, cultural and moral values -- as opposed to scientific values -- play in science courses? Does science have its own morality, its own ethical standards? Should these be taught?

This case study cannot offer answers to such questions, but it can point to their reality, at least for these teachers. It can also offer supplementary detail which might help fill out the brief scenario that heads this section.

The Teachers

David and Steve both teach ninth-grade earth science. This means they teach one period a day to each of four classes, and have one team meeting a day with the English, math and civics teachers who teach the same students. On paper they therefore have only one preparation a day; but they both said that classes vary so widely in attitude and achievement that two, or sometimes three, different kinds of lessons have to be prepared on the same topic.

Both David and Steve have been teaching four years, and have done all their teaching in the city. David trained primarily in biochemistry (to Master's Degree level) and nurses an ambition to teach a biochemistry course at high school. Steve majored in history, but with enough science courses to be able to get accreditation as a science teacher. (He is the one science teacher who invariably wears a white lab coat. The joke is, that when he walks away from you he reveals a large picture of Woodstock emblazoned on the back.)

Once teachers have been employed in city schools for four years, they have tenure in the system. At the end of last year both David and Steve were formally fired (at the last possible date), and didn't know until hours before school started this year that they were going to be offered employment. Ninth-grade earth science is the bread and butter of the science department, employing five of the department's twelve to fourteen teachers (depending on whether you count those teachers in alternative programmes). David knew that he had to be prepared to teach ninth-grade earth science. Steve knew he was more likely to be offered a job teaching science than history, and that in science the demand was for ninth-grade teachers.

In one sense both teachers found themselves in their present jobs by circumstance rather than choice, with the exception that they both wanted to remain at this school. On

the other hand, it would be misleading to push this point too far. Both are concerned teachers, highly regarded by their students and their head of department. They work hard at their teaching, sometimes to the point of obsession (Steve came back from the one-week winter break saying, "That's the first time I ever remember being away from school for a week and getting so that I just wasn't thinking about the kids any more"). Most days they can be found in the teachers' lounge or the lunch room discussing science, their course, their classes, or all three. ("We're still new enough to be pretty gung ho" David explains, as if to apologise.)

Although there is a lot David and Steve share in common, there are also differences between them: intellectual differences (as in the conversation we started with), and differences in style. In class David likes to set a climate of quiet and order; he goes to some lengths to keep his room clean and tidy and uses the arrangement of the room to accentuate his presence (a striking black board helps, too). His classes are carefully structured in the sense that he often fits three or four different, but related, activities into the forty-minute period; all the while keeping a sharp eye on those who drift from the task at hand. He presents himself as hard working and serious (both words students used to describe him), but a cynical, reflexive humour is never far from the surface. (It's a difficult kind of humour to describe but it seems characteristic of the city. Perhaps its main feature is an assumption that everyone always acts from the worst of all possbile motives, but that the teller has seen it all many times before.)

Steve's style is more extrovert: he wears his ego on his sleeve ("He puts such a lot of himself into his lessons," says one of his students). Teachers commonly protect their vulnerabilities by displays of authority, but Steve seems to enjoy putting himself at risk. He often seems to be pushing at the bounds of the conventional, especially out of class. Walking around the school with him can be like following the Pied Piper; students appear at doorways and follow him 'round. It's a continuous performance, humanising what must sometimes seem an inhuman institution. (Perhaps it is misleading to single out Steve in this way, for it is a quality many of the teachers, and some of the aides, share in different ways.)

One of the things students in both David's and Steve's classes agree on is that they separate the social and the academic facets of schooling. "He'll actually say to you, 'I think you're a lovely person, but on this work you get an E.'" That attitude, the students claim, is unusual. "There are so many teachers who think they can get 'round you by giving you better grades than you deserve." A concern David and Steve share is for standards, and it seems to communicate itself to the students.

The following record of observations in David's first period class, Tuesday and Wednesday, reveals this.

Tuesday. There are nine boys and eleven girls in class and it is one of the middle sections. David is talking to them about the lab reports he wants them to write:

> *I want you to assume I know nothing. Someone reading your lab report only knows what you tell them. I want you to report everything, so that when I read them, if I was someone who had never done the experiment before, I could read your lab report and know what to do, and what I would find.*
>
> *Now you have three experiments I want you to do to show that air exists. One of the experiments I want you to do will take a day, so today do these two because I want you to hand in a report today. Yes, everyone is to hand in a lab report at the end of this period. You can work in twos or threes, or on your own, but everyone has to write their own lab report.*

(Someone asks, "Do you write it as you are doing it?") It's a good idea to write things down on a scratch pad while you are doing it. Remember, nothing is too simple to write down. What's the first thing you write? Your name and a title, that's right. Second? Equipment and materials. Write down everything you use, even if it is only a little spatula, because if I am trying to do the experiment from your report I want to be able to take out everything I need before I begin the experiment.

Third is what you do. We call that procedure (writing it on the board). Fourth? Fourth is observations. Remember nothing is too simple to write down. Fifth is conclusions. That's where you look at your observations and look at what you are trying to prove and make some conclusions.

Tomorrow we'll go over it and I'll give you the correct conclusion. Everyone should get the same result; but it's your personal conclusion I am looking for, so you may report the conclusions differently.

David gives out the jam jars and they get to work on the experiments.

Wednesday. Twelve boys and twelve girls are in class and two more girls come in late. David sends one of the students out to fetch notebooks for the class:

Today we are going to be setting up the wire wool experiment. That's the one that is in the back. It'll take about fifteen minutes to set up but you'll have to leave it until tomorrow before you get the results. Last night I went over your reports on yesterday's experiments and I like the way you did it. When you get your notebooks I'll go over it.

He gives out the sheet which describes today's experiment. It involves washing wire wool in vinegar, stuffing some in the end of a test tube, inverting the test tube in water. By marking the water level in the tube, students can estimate the amount of oxygen used up in rusting the steel. He goes through the procedures carefully. ("You need to use the vinegar to remove an anti-rust coating they put on the wool.") Within ten minutes the experiment is set up (five groups) and he moves the students back to their seats. The notebooks are given out and he goes through yesterday's lab reports.

The first experiment involved pushing an inverted drinking glass into a jar of water and finding that bits of paper jammed in the bottom of the glass remained dry.

"This experiment shows that air exists, that it has pressure and takes up space. If you tipped the glass to the side, what would happen?"

"Bubbles."

"Bubbles, yes you'd get bubbles; what would be in the bubbles?"

"Air."

"Air would escape in the bubbles, and what would happen to the water level in the glass?"

"Go up."

"It would go up. It would rise because there would be less air in it to press the water level down. The air would take up less space. What if we put a hole in the end of the glass?"

"The air would escape."

David writes on the board: "Conclusion. Air is all around."

Air is all around and occupies space. ("Those are the key words," David comments.) The drinking glass contains air. ("I'm going to do something different this semester, I'm going to collect in your notebooks, and those who take the notes will get credit for doing it.") The water pushes against the air, but can't enter unless the drinking glass is held at an angle to permit some of the air to escape.

David next demonstrates the second experiment, which is to float a cork on water and then press it under water with an inverted, air-filled drinking glass.

"Describe where the cork is," David asks.

"Below the water."

"Right," says David. "The pressure of air presses it down. Air occupies space. Air has weight. If I tilt the glass, air escapes and the cork will rise. I'm going to put the answer I want on the board."

He writes: "Conclusion. Air is a substance ('Just like solids and liquids'). Air is a real substance and takes up space just as do liquids and solids. The air presses down on the cork, forcing it down. Since the drinking glass is full of air, no water can get in unless we first let some air escape." He reads it out loud and waits for the class to write it down.

You may think these are things you knew all along (he says), but I want you to get used to putting it down in this form. Let me give you a word of advice. I'm going to be giving you some notes each day; if you miss a class, make sure you make up on the notes. You won't always be able to catch up on the experiments, but make sure you get the notes. . . . For homework, I want you to find out what gases compose a volume of dry air.

With ten minutes of the lesson left, he begins a class discussion:

"Where does our atmosphere begin?"

"At the ground."

"Where does it end? How high? (pause) Is a thousand miles too much?"

"No."

"Actually it's nearer two thousand miles. But most of it is concentrated in the first thirty to fifty-five miles. Has anyone ever climbed a mountain?"

(Some yeses)

"If you ever climb a mountain, or go to Denver, you know that the air gets thinner. Denver is at 6000 feet, and that high the air is thinner than it is here near sea level. So most of the air is in a thin layer around the world, and it's in that layer that we get weather. Can you give me a definition of the layer?"

"Earth's atmosphere."

"Remember the definition I gave you the first week?"

He writes on the board: "The great ocean of air that extends thousands of miles above the surface of the earth and gradually thins into outer space."

"That's the definition I want. . . . Man lives at the bottom of this great ocean of air. Can he survive all the way up in it?"

"No."

"What would he need?"

"Oxygen."

"How would he take it?"

"In tanks."

"He'd probably need protection from radiation as well."

David goes on to introduce the topic of aerosol sprays:

They contain freon which is a gas that is lighter than air, and rises through the atmosphere to react with ozone [a kind of oxygen], making little holes that let radioactive particles through. Since we started using these spray cans the number of cases of skin cancer has risen 200 times. . . . If we stop using spray cans by 1980, it may be in time to stop it getting worse. It won't be any help to those people who already have skin cancer. We can't go back to where we were, but we may be in time to stop things getting worse. . . . You can't hide from radio-activity, it penetrates everything. Lead will protect you from alpha-particles. . . . We know gamma rays exist but we don't know their effects. . . .

David and Steve both find that they need to plan their lessons for the lowest ability groups quite differently from those for the higher ability groups. Sometimes, as with the air experiments, David will say he'll try it with them, but at other times he will do something quite different.

Both teachers are working through the part of the earth science course that deals with the atmosphere and goes on to look at weather and climate. Both of them are trying to establish the idea that air has substance, and that it has characteristic properties. We have seen how David has set about this problem by having the students work through a number of experiments (which are not all in the text), which cumulatively he hopes will give the students a feel for the key concepts. It is crucial to his approach that the students do the experiments themselves (even if they know what will happen) because the tactile sensations involved are as important as the demonstrations and explanations.

With his low ability group Steve, too, is trying to get the students making things. But feeling they would be bored by the kinds of air pressure experiments David is doing, he has them making models of atoms using polystyrene spheres. The students could set their own level by choosing which atom to build; and then, having coloured the spheres (red for protons, blue for neutrons and white for electrons), have to assemble a model using wire and a wooden base board.

In his other classes Steve is using a trial curriculum project from a mid-western university which is orientated to career education. Although it involves a number of teachers from different subjects, Steve seems to have made it into a course on pollution (whether this is his emphasis or the project's it is hard to make out). With his usual enthusiasm, he is planning to take off a day without pay so that he can attend a regional conference on ways of teaching air pollution by experiment.

Conversation 2
Grouping and Standards

Mike is a biology teacher who has been teaching four years. John is an ex-student of the school who has been a teacher here for over twenty years. He used to be in charge of ROTC, but when that was phased out a few years ago he was given the job of teaching health education. Although he does not formally belong to the science department, the boundaries are fuzzy; some science teachers also teach health education, and John has a room on one of the science floors of the building. He told me he also has a son who is involved in curriculum development ("He works with someone who has license plates on his car with the letters BSCS").

Mike: *The real problem here is trying to teach classes where some students want to learn, and perhaps plan to go to college, but where these students are mixed in with other students who don't much care and who took biology just because they like the idea of cutting up frogs.*

You can't teach to the level of the good students because the rest get bored and start disrupting the lesson and it gets so you don't like to let the scalpels out. And you can't teach to their level, because then the good students feel you don't care about them, and then they get bored and complain that science isn't really very interesting.

The only answer I can see is to separate the two groups, so that at least you get those students who are interested and want to learn together in one group.

John: *But if you do that it's called discrimination. And we know all the problems that follow from having that kind of grouping.*

Mike: *Well, grouping is illegal in this state anyway, but it still seems to me that that is the real problem. I am a science teacher. I want to teach science. But how do you teach science to students who have the intelligence and want to learn when they are all mixed in with a lot of students who just don't seem to want to know?*

I can see why you don't want tracking or grouping in a middle school, or even in ninth grade, but when you get to more advanced courses the teaching problems are different. If you are going to maintain standards, you have got to have classes where at least most of the students are interested and want to learn. Otherwise our courses will not be what they say they are.

John: *But in the end you have got to make a decision between having an elite group, where you put the best of everyone and everything together, and having a more democratic system.*

I've been involved in special elite groups [in the services], and I know how effective they can be, especially when you want to get something done in a short period of time. But the problems we face as teachers aren't just the problems of teaching science, or the problems of teaching anything else for that matter. It can be hard when you find you are not maintaining standards like you once did, but the problems are not even just educational problems.

When I look at the problems schools face, I think the only answer is for us to put our trust in democracy.

Mike: Some students do want to learn, and perhaps that makes them a special group. Often, though, they are not getting a chance because of the way we mix them up with those who don't want to learn. You talk about democracy, but is that really democratic? Taking freedom away from some to make them like everyone else?

Conversation 3
Biological Warfare

Bob, who teaches the second and third year biology classes, was talking about one of the bacterial cultures they used:

It's a nice one to use because it is bright red and you can get some pretty effects with it. We always thought it was harmless but it seems in rare cases it can cause pneumonia. It's one of the bacteria the Army released in the New York subway to study the spread of micro-organisms.

It seems an amazing story, but sure enough Bob brings in a newspaper clipping two weeks later which reports the story. Yes, in preparing for biological warfare, the military did quite a lot of experiments over a long period to study the spread of micro-organisms. The New York subway was one of the source sites chosen, and it was true someone had recently died from pneumonia contracted from the bacterium.

Bob told the head of science he had called the Science Centre to tell them he was destroying his cultures. "And over there," he said pointing out the window to one of the nearby universities, "they are probably doing recombinant DNA research with very similar bugs."

Conversation 4
"To Serve Man"

David comes in with a science fiction volume under his arm. It appears he is a keen devotee of the genre. "I'm going to read a story to my last period class" (his low ability group). "I've decided science fiction is probably more relevant than science to a lot of them."

The story is called, "To Serve Man." It is about an alien group who arrive on Earth and solve all our problems, technological and social. The hero of the story is suspicious of their motives and questions their altruism. He obtains a copy of a handbook the aliens have called "To Serve Man." After months of work trying to decipher the strange language, he learns (in the last sentence of the story) that the book is a cookery book.

Conversation 5
Between the Clusters and the College-Bound

Three experienced teachers (science, modern languages and English), none of whom is involved in ninth-grade teaching, are discussing the merits of the cluster system.

A: There shouldn't be any need for the clusters. If the office downstairs were doing their job, there wouldn't be a problem.

B: I disagree with you about that. There isn't another school in the city that can handle the problem, whatever the administration does.

A: Well I think there are other schools that have a stronger administration that do a better job.

B: You can't say that things aren't much better this year than they were last year.

A: I don't know about that. The trouble now is that kids are being kept in school who would have dropped out before. I know the figures look good, but the problems of classroom discipline are worse because the teachers are having to cope with kids who don't want to be there.

C: I dread to think what will happen next year when those same students come back and they are no longer in clusters. It will be chaos.

The ninth-grade cluster system emerged partly from the collaboration between the school and a local university. It has its disadvantages, reducing flexibility in departmental scheduling. (Because "cluster times" are concentrated at the beginning and end of the day, other subjects get jammed into the middle.) It is also heavy on staffing; because cluster teachers teach four, rather than five, periods a day, the system requires overall an additional five teachers.

Generally the scheme is counted as a success. Teacher A is unusual in his view, though his point about the scheme containing difficult students and thereby increasing its own problems contains some truth. Behind his remarks lie other, less often expressed but frequently felt, feelings of distinction between the ninth-grade teachers and those who teach more advanced or more specialised courses. For the most part, the ninth-grade teachers are younger and more junior; they do not lack experience, but they tend to be vulnerable to tenure regulations. The school is already under pressure to reduce its faculty (by 6.6 next year), and cluster team teachers are perhaps more worried about their jobs than some others. Teachers who teach less academic courses (physical sciences as opposed to physics; basic math as opposed to trig or algebra) seem to feel the cluster scheme to be more of a threat than those who teach advanced courses. They are the teachers who tend to collect the most difficult students, in the main to teach in a more "traditional" manner (this is not intended as a criticism), and who most lack membership of a formal organisation within the school (the department system is weak and inevitably dominated by specialists; and they have, as yet, no organisation equivalent to the cluster team). Perhaps not surprisingly, such teachers often feel a slight sense of isolation within the school as a whole (formally, that is). Isolation shows itself in different ways: suspicion of outsiders and new plans, over-reaction to attacks on their authority, and a general skepticism about the motives and interests of anyone who seems as though they might be offering advice.

The administration feels it has been working hard to reach this group of teachers, despite occasional lapses on the part of individuals, when mutual feelings have been exposed. Nevertheless, it remains generally true that this group of teachers remains the one most neglected by curriculum development and innovation. In science at least, teachers in the more advanced and specialised classes have either tried the new curricula and found them wanting, or have worked to develop their own courses. The ninth-grade teachers seem headed in a rather different direction, being more conscious of cross-disciplinary issues and as concerned about teaching methods as about curriculum. Between them lie a number of teachers who seem mostly to stand outside the institutional spotlight, and have often become resistant to, and cynical about, talk of innovation or change.

Conversation 6
Teaching Methods in the Cluster

Teaching methods is an issue that emerged in several conversations between members of the cluster teams. The "conversation" reported here has been assembled from various fragments and so lacks the authenticity of others reported in this section. I hope it is no less true. I have done my best to illustrate accurately what I think is an important emerging issue.

Civics Teacher: I feel constrained by the forty-minute period and the pressures of working in a building that is really only a heap of classrooms. I'd like to be able to get out more with the students and get to do more different things.

Science Teacher: I don't agree. I think almost the most important thing for the students to learn is the discipline of working in the classroom. When they come here at the beginning of the year they are all up in the air, and we have got to bring them down. You've got to get order and discipline before you can give it up.

Civics Teacher: By this time of year [March] they should have learned some sort of classroom discipline. The problem is that enforcing it starts to become an end in itself. You begin to forget about what you are trying to teach and just think about keeping a neat, orderly class.

Science Teacher: I don't just think of discipline as keeping an island of sanity in my class, whatever happens in the rest of the school. I don't think you can separate discipline in class from the discipline of the subject. In science especially, where you have expensive equipment and valuable things around, you have to learn certain ways of behaving and learning those ways of behaving are [sic] part of learning the subject.

Second Science Teacher: I'd like to get out of the classroom more because there are a lot of things I want to do that you can't very easily do in school. I think really the only way to get students to appreciate the significance of things like environmental pollution is to get them out of the classroom looking at it.

English Teacher: My classroom is important to me. I can't imagine a better place for doing the kind of teaching I want to do. Going outside the classroom on some occasions might have advantages. I'd like to have students going out to interview people, for example. But what they do in the classroom [which is mainly writing] has got to remain at the centre of everything else for me.

Civics Teacher: Sometimes I feel limited by the expectations the students have of me as their teacher. For most of them the range of things they will allow in a teacher is very limited and this makes it very hard to start anything new or different. The experience I have had in the past of working a lot outside school has shown me that you can have quite a different kind of relationship with students once you get them out of the school building.

English Teacher: I don't want a different kind of relationship. I want to be the kind of teacher I am.

Conversation 7
Solar Heating

Following the severe winter there had been a lot of talk in the press about alternative energy sources. One outcome was a scheme to award $400 grants to house owners who installed solar heating in their homes. Steve was very keen on the idea, not for his home but for the school. He thought perhaps he could get a grant from somewhere to install a prototype plant on the roof of the school, perhaps in conjunction with one of the local university engineering schools. Over the course of two cups of coffee and an unappetising sandwhich from the lunch room, he convinced himself the scheme was feasible. Someone suggested that if the plant could keep the coffee hot and keep its price down, he would get unanimous support from the faculty. Undeterred, Steve went off to lunch room duty still making plans.

Conversation 8
When is Trig, Trig?

Tom is a teaching practice student in the math department. He trained as an engineer and previously worked as a systems engineer for a computing company. One of the courses he teaches is in trigonometry:

I came here thinking that trig would be the course where I would really be teaching math, but I find the students have such a poor background in math that I'm really not teaching math at all. When students don't know how to multiply fractions, there seems little point in going on with cosines and tangents; so most of the time I am doing basic math with them, even though the course is called trig. I worry about the long term consequence of doing that, but the subject is fundamentally sequential. There's no point in going on until you have mastered each stage. I've tried individualising things for the students so that those who are ready can move on, but it soon gets very complicated, and I feel from the teaching point of view I need to keep them together as a class as much as I can.

Conversation 9
Introducing New Materials

Bob, who teaches the advanced biology courses, has been teaching at the school for ten years. Three years ago he took a year off because he felt depressed at the way things were going and because he wanted to rethink his decision to teach in high school. You only have to spend a few minutes in his class to realise that he is an extraordinarily able teacher. He has an easy, good-humoured relationship with his classes; indeed, his third-year course was invented at the request of the second-year students who wanted to spend another year with him and pressured the system to provide it.

During the period of this study, he was running a very thorough and basically practical course in microbiology. He told one of the site visit team that he had not met any prob-

lems in obtaining and using any book he wanted ("I tried BSCS, didn't like the molecular biology version, but I found it was a lot of fun doing the one that was supposed to be the easy one"). The only exception was the area of human sexuality. Indeed, he explained he had just spent $104 of his own money buying a set of books for next year (the Saunderson Series). "Couldn't he have bought them through the school by requesting they be put on the list of recommended books?" the visitor asked. "I don't know how you go about doing that," he answered. At that point the head of science, who overheard the conversation, pointed out that in fact he was on the committee. Bob didn't know this, and it seems no one in the department knew, either.

Comments

The conversations I have selected here were those that were relevant rather than representative. Nevertheless, I have made something of a display of teachers' lounge conversation and I think I should suggest why I think it is important.

One reason is that, in the absence of a clearly structured bureaucratic organisation (there are very few formal meetings for most teachers), the conversations provide a point where information is communicated and where some kinds of consensus and conflict are generated. The school would be a less coherent organisation if the room (or something equivalent) didn't exist. The fact that, for me and at least some teachers, it is a pleasant place to be is quite an incentive for some. It eases the daily routine and provides a source of morale.

Observing David and Steve's lessons, I felt I could see the influence of their conversations on the way they taught. David's references to aerosol sprays in class, for instance, followed a conversation with Steve where Steve was urging that science teaching should connect up more with daily or political concerns. This interpretation may be quite wrong, but it suggests an interesting line of speculation. Many people agree that existing in-service courses have a limited effect on classroom teaching. Perhaps what we should do is consider those things that do influence what teachers do in class and see if there are any ways in which they can be supported or strengthened. ("How about an NSF project to foster and improve teachers' lounge conversations?" Steve suggested.)

POLITICS AND HISTORY: WHY ARE THINGS AS THEY ARE?

When the teachers tell you why things in the school are as they are, they invariably turn for explanation to the history of the school and the politics of education in the city. The longer they have been in the system, the more inclined they are to offer an analysis of long term historical trends. The younger teachers mostly tell of the political complexities of the last few years.

Bill Connors, head of science and a teacher at the school for more than twenty years (and before that a student in city schools), sees the present in terms of patterns established over three or four generations:

> *This city is a first port of call for immigrants, it always has been for more than 200 years. One group has always succeeded another. The Irish, the Chinese, the Jews, the Italians, then the blacks from the South, and now Puerto Ricans, West Indians and Haitians. As each group has arrived*

they have settled in an area of the city that, at the time, nobody else wanted and they have made it their own. But as soon as possible they have tried to get out to something better, to the suburbs, or another city or another part of the country. If they haven't made it out themselves, they have done all they can to get their children out.

Those ethnic neighbourhoods still exist more or less intact, but most of the people who are left in them are the ones who have been left behind, in some cases for three or four generations. They know they are not going anywhere, but the thing that keeps them from being right at the bottom of the pile is that there has always been a new immigration of people who are different and who are consigned to an area that is even poorer than where they live.

So in this city there has always been a mixture of the new immigrants coming in and immediately pushing to get out to something better, and seeing the school system as offering a way their children can get on, even if they can't make it themselves. And those who have been left behind, who know they are not going to make it, but who are determined that no one is going to take away from them the little that they do have.

The pattern is a familiar one in the history of America, but in this city you sense that the historical process is still alive. Unlike some cities, Boston has never achieved great financial wealth or economic growth that might have deflected attention from the social process of assimilation. Through the sixties and seventies, immigration has continued. One of the younger teachers, a civics teacher, emphasises the point:

If you look at the records here, you'll find a high proportion of our students were not born in the city. People sometimes think that all blacks, for example, came in from the South in the sixties. In fact you find a lot of those families have already moved on. To the suburbs in some cases, but more often to Detroit or Canada, or even back to the South.

Jim Kelley, a chemistry teacher at the school for sixteen years, agrees:

You know people talk a lot about "white flight," but it has always been expected here that people would move as soon as they got the chance. I grew up in an area that is now one of the "black ghettos," but the whites who left our street didn't leave because the blacks came. Long before that happened, they'd all planned to leave just as soon as they could. When I think of the kids I was at school with, they all said they would leave, and they all did. Except me I suppose, but I'm unusual because I came back; but not before spending some years in California.

For the past three years the city school system has received national attention because of a federal court desegregation order imposed on the school board and the superintendent's office. Dennis, the civics teacher, says that having lived close to the problems for several years (as a union official he represents the union on the city's desegregation committee), he finds himself viewing it as a class rather than a racial conflict:

Three-quarters of the metropolitan population live in the suburbs, and that includes ninety-something percent of the middle class. Racial and ethnic divisions within the city function only to weaken the political position of the city relative to the state.

Ultimately Dennis feels the only real solution to the problems faced by city schools lies in planning on a metropolitan, rather than a city, basis. But such solutions, he feels, are unlikely in the extreme; and he has to content himself with feeling optimistic about more minor changes, such as a much-publicised drift of a very small number of (mostly childless) professional middle class families back into the city.

Bill Connors is even more resigned. He doesn't feel that there is much that the schools can do to affect the real nature of the historical process, or perhaps much anyone can do. As is true for many other teachers in the school, his daily horizon is closer; the things that keep him teaching are not the hope of bringing about social change, but the fact that he enjoys what he is doing, likes the kids, and finds himself in a school where these things are still possible.

A growing trend in education, here and elsewhere, is that issues that were once thought of as purely educational or administrative, are now considered political. Recent events in the city exemplify the trend. Three years ago city schools were desegregated under a federal court order, a decision met by opposition and violence. One city high school still operated under the receivership of the court with a court-appointed administration. You need look no further than the local press to see how much education dominates city news. One week during the study, school-related issues accounted for 40% of the front page space of one of the city's leading newspapers.

In part this politicising of education reflects an unusual political and administrative system. The five-member city school board is elected on a city-wide basis and is able to determine its own budgets, free of constraints by the mayor and city council. The result is that the school board enjoys a high degree of centralisation, autonomy and power; and politics therefore enters education to a degree perhaps greater than in other places. Indeed, one of the key issues at the time of the study was whether the present system should be changed. The mayor, having served several terms and worked himself into a position of some authority, and perhaps hoping to catch the school board weakened by its failure to defend itself in the federal court, made a bid for charter reform. Anxious to gain some grip on the school system budget, the mayor suggested financial reform alongside more extensive representation on the school board. It was a move that created some unlikely alliances but met with little success after a promising start. For me, my confusion in the face of events illustrated how difficult it is for an outsider to interpret the local political process; for things have long passed simple confrontation and have moved into a realm of hyper-complexity.

Dennis, the civics teacher and union representative, is closer to the political process than most, but he shares the general sense of disbelief at the total prospect. Throughout the city, corruption seems rife; in fact, beyond the city, too (during the period of the study two state senators were found guilty of extortion and the county sheriff was forced to resign). Some people close to school system believed that the current chairman of the school board had paid $50,000 for the position, and that people regularly paid $10,000 for the position of principal. "Village politics on an urban scale" is how one local newspaper journalist put it in a radio interview.

As an outsider and foreigner, understanding little of the situation, I was easily shocked by such things. But perhaps what was most surprising was that, though the local press gave such stories considerable coverage, they rarely surfaced in day-to-day conversation. When they did, people's reactions seemed mixed and confused. Perhaps America has suffered a surfeit of such revelations in the last few years, for the main reaction was one of apathy, disinterest or despair.

THE REAL WORLD OF THE ADMINISTRATOR

During the site team visit, the high school principal expressed the view that a major problem with any proposals that might emanate from a body like the NSF was what he felt to be a lack of understanding of the work of the administrator in an urban school. He suggested both that national bodies should understand better the real world of the school administrator, and that they should consider the kinds of training available to people entering the administrative careers. The best he could find to say of his own experience of administration courses at three different universities was that they contained things that were interesting or helpful after several years experience of the work, or things that gave him some rationale for actions he would have taken anyway on the basis of professional experience. What seems to be lacking is understanding of the day-to-day routine of the administrator's life, and hopefully some ways of short-cutting experience. Mr. Henry, the high school principal, went on to say he had few positive suggestions to make himself. He felt internships might offer some answers, but what he was most keenly aware of was the shortcomings in the courses he had experienced. In particular, he felt inadequately prepared to deal with curriculum development, and with the press of daily crises.

A thorough exploration of this question is beyond the scope of this study; what can be offered, though, is some glimpse of the real world of the administrator framed by Mr. Henry's plea.

Snapshot 1

The principal sits in his wood-panelled office discussing the effects of next year's proposed cuts in the numbers of school aides with the two assistant principals. At his feet is the megaphone used the previous day for marshalling the school's occupants following an evacuation of the building for a fire alarm. Around the room are numerous photographs and a small collection of certificates. (Wallet-sized pictures of last year's graduating seniors slipped around the frame of a bulletin board, family pictures, photographs of the principal entertaining distinguished visitors to the school, a rather fine candid shot of the principal standing in front of the school listening attentively to a student, a more formal shot of him addressing the school.) A table loaded with impressive-looking sports trophies from the past; a beautiful vase standing over a foot tall with the face of its maker on each of four sides, which a student had presented to the principal after winning first prize in a city art contest.

It is 7:50 a.m.; Mr. Henry has been in the building twenty minutes and has already spoken to more than twenty people. Every time he puts his head out of the door there are people waiting to see him: students, teachers, visitors to the school. Several people function to screen the waiting line; two secretaries, the two assistant principals and an administrative assistant. In an open area office, these things are handled delicately and informally.

Mr. Henry has a schedule for the day: a meeting with the two assistant principals, a meeting with the guidance staff, a meeting with a salesman from a yearbook publishing company; then at 1:30 he is going down to the school department offices, returning to the school later in the afternoon, and perhaps staying for a meeting of the parents' committee at 6:30. It sounds mostly routine, but there is no telling what incidents and events will punctuate the formal programme.

Already on his mind is a bomb threat. Last night he received a call to say a bomb would go off in the school at nine o'clock. There seemed to be no point in telling the police immediately, so he called them from home on his way into school. Two policemen were in the office when he arrived. After a brief meeting with the assistant principals, two teachers were sent out to tell one teacher on each floor of the building to check for any suspicious circumstances. "Look in the bathrooms and for any open locker doors," says Mr. Henry. It isn't an unusual indicent; he knows what to do, but there is always the thought that this one could be real. (I expected, around nine o'clock, to see him glancing nervously at his watch, but I don't think he looked once.)

Snapshot 2

A young teacher (female) from the bilingual department catches Mr. Henry as he puts his head out of the office door, to tell him there is a dead mouse in her classroom. "Call the custodian," someone says, to be met by laughter (an accepted school joke - the custodian can never be found). Mr. Henry says he'll deal with it, leaves the office and proceeds upstairs by way of the escalators. Once in the classroom, he puts the rather badly mutilated mouse in a stray paper bag and removes it to a downstairs trash bin.

The decision to go seems almost impulsive. A chance to escape the office, to see something of the school, and to be seen. A sure way of making sure that something actually gets done with the minimum of fuss and delay. A rare opportunity perhaps to do something concrete, tangible and useful. Perhaps also a chance to escape the confines and false dignity of the role.

Snapshot 3

During homeroom Mr. Henry picks up the phone in his office and dials into the school intercom so as to read the morning announcements. "Congratulations to the chess team . . . Would the basketball team report to the gym at one p.m. . . ." Part way through, his assistant adds some more notes to the pile and Mr. Henry switches to Spanish. When he has finished he calls to the assistant, "Hey next time give me some warning about that. My pronunciation is rusty, especially the numbers."

Snapshot 4

The visitor sitting outside the principal's room has not been to the school before and doesn't realise that it is the principal she has seen coming and going through the door. When she does enter the office, she can't get over her own sense of surprise that Mr. Henry is the principal. It isn't just the fact that he is younger than most people expect, but something about his personal style. Elegantly dressed in a three-piece suit, $45 shirt and handmade shoes, he could pass as a successful executive in any business outside education, and he can use his considerable charm simultaneously to create both informality and a sense of distance. The visitor says she finds it hard to express these things; it's just that Mr. Henry wasn't quite her image of a typical high school principal. She had the feeling of some dissonance between the man and his office, a lack of fit between the style of the person and the style of room.

Snapshot 5

In the meeting with two assistant principals, and again in the meeting with the guidance staff, there is no doubt that Mr. Henry is in charge. He listens patiently, sometimes attentively, conveying a lot through subtle shifts in varieties of the informal style that seems to be his hallmark.

"I've learned the management lesson of the sixties," he says, "which was how to humanise the administrator. But you can't run a fast moving school like this just by being human."

When he first came to the school he was unused to the scale and size of the place (2,300 students), having mostly worked in small scale settings. He says he had to learn to adjust to the workings of a large school while retaining his educational values. He came from an alternative school where people were closer, and inevitably more dedicated to teaching than teachers in a regular public school.

Snapshot 6

A teacher comes down to the office angry over a confrontation with a student and saying he is going down to the court office to file a complaint. Mr. Henry clearly feels that the teacher is overreacting, but clarifies the situation. Later he confronts the student, who comes down to the office even more angry and complaining that the teacher has been marking him down on his grades; independently he had taken his work to the head of department and had had this suspicion corroborated. Mr. Henry and the assistant principal argue the case with the student, trying to persuade him to stay with the class, even if he feels he is being discriminated against. The student, a mature older boy, finally breaks into tears. The student, the principal and his assistant are all black; the teacher, white. No one talks about it as a racial incident, but it is hard to tell what undertones the situation contains for those involved. The critical point perhaps is that it is not an incident that spreads, but is contained between the participants.

Snapshot 7

Following an in-service meeting in which one of the assistant principals (in Mr. Henry's absence) criticised the teachers for arriving late in the morning, a group of teachers in the teachers' lounge are discussing Mr. Henry as a principal. It is interesting that Mr. Henry isn't a frequent topic of interest or conversation amongst teachers. He presents himself in the role of trouble shooter and organisation man, perhaps feeling closer to the students than to the teachers. Any changes he encourages in either the school or the curriculum he tries to make sure are seen to come from the faculty rather than being imposed from above or from outside. Some teachers feel he has little understanding of what is going on in the school, and it is true that any vision he has for the school is something he tends to keep to himself. On the other hand, the teachers defend him in terms of the good image he presents to the outside. It is in the community and at the central office that the teachers see him as being highly effective. Perhaps paradoxically, he sees himself as an "inside man." Inevitably he occupies a salient position in the city. He is the

youngest high school principal ever appointed, the first black, and the first outsider appointed in forty years. Like others who have risen rapidly to power, he lacks a penetrating informal network outside the school and fits uneasily into a system notorious for its patronage, insularity and corruption. (The students seem quick to make the inference. Two students waiting outside his office door compare him to President Carter; but as one points out, "his secretary, she don't look like no presidential secretary.")

ALTERNATIVE 1: OPENING THE CLASSROOM DOOR

In the late nineteen sixties and early seventies the curriculum development movement began to attract criticism on the grounds that it did not change school practice deeply enough to make a significant educational effect. Those in urban schools, particularly, argued that more basic changes were needed in the structure of relationships within the institution, and in the relevance of the curriculum. This wave of innovation (the alternative school idea, we might call it) seems to have left a deeper mark on the high school than the currriculum reforms that preceded it. In this section I hope to trace some of those marks.

Teachers who were teaching in the school through the late sixties still remember it as an unstable, but perhaps exciting, time. As we have seen, it was a period in which the school rapidly became predominantly black, and was then run down under various re-districting plans before being threatened with closure on the eve of its transfer into new buildings. In fact, in the court desegregation case that followed, the school was a key instance used by the judge to determine that the school board and the superintendent's office had deliberately acted to segregate the school system on racial lines. At the same time, campus unrest was at its peak, and the publication of a book by a radical critic of the city school turned the attention of radical students to the high schools. It is said in the high school that the rumour was that if the students could "break" their school, then the whole school system would be opened up to reform. At this time (the late sixties), the school had to learn to cope with infiltration and attempts to provoke student unrest, an experience that seems to have stood them in good stead some years later when busing was introduced. (Looking back to the press of the time, a recurring puzzle seems to be why this school did not experience more trouble. This seems to be part of the reason.)

Although the spread of student unrest to the schools seems to have been stopped in an organisational sense, many of the ideas have had an effect. The school is proud of the several alternative programmes that thrive within the organisation, and it is significant that the present principal previously worked in an alternative school in another state.

What were the ideas that eventually struck home? Well, they seem to be those things loosely grouped under the term "relevance"; a feeling that the normal school curriculum has little to offer most of the students. The students, critics said, were not asking for "new" math and science courses but were asking, "Why learn science at all?" That's a question teachers in the school still ask themselves with some seriousness, and many work hard on possible answers.

The MASH Programme

Chris is a biology teacher who works virtually full-time in the MASH programme. This programme, now two years old, was set up within the overall organisation of the school for

students aspiring to careers in the medical field. None of the teachers who devised the original programme actually got to run it; and those teachers who do run it sometimes suspect it was put together with little thought that it would actually come to fruition. Chris is highly conscious of gaps that exist between the dreams of the planners and the daily reality.

Four teachers are involved (English, math, science and history), covering the required course areas. The students spend their mornings taking required courses, and their afternoons in work placements in various medical facilities.

Last year more than seventy students opted for the programme; this year more than fifty. But the nature of the students has changed. In the first year they tended to be the students no one else wanted; this year they seem more seriously engaged in the aims of the scheme. Although, to everyone's regret, they lack a space they can really call their own, away from the main school site, there is some feeling of community about the rooms they use. It is one place in the school you find an effort to display things on the wall, and to create spaces within classrooms using bookshelves, cupboards and potted plants. And it's a place you can find groups of students sitting around talking and socialising without being moved on by aides or teachers. Part of the problem, Chris explains, is that in working to create a different and more informal atmosphere, they inevitably attract students who are not in the programme but are just drifting around the school.

The main problem the programme faces is more crucial, however. As the teachers have interpreted the scheme, the essence of it was to be that the impetus and direction of the curriculum would develop from the work experience of the students. In this way they would meet the relevance question head on. As teachers, they saw their role essentially as a service role, building on the needs, queries, questions and difficulties met by students in their work.

Inevitably, a key prerequisite to the scheme was finding appropriate and stimulating work experience. This has been a problem. Despite the maze of hospitals that surround the school, physical proximity masks some enormous bureaucratic distances. Often, Chris explains, people at head-of-department level are helpful and even enthusuastic about the scheme; but the organisation then makes demands on the qualifications, behaviour and reliability of the students that are difficult to meet. Students often get placed in menial or routine jobs where they feel they are being used as a source of cheap labour, and where they complain of being badly treated by those in charge of them.

The teachers set out without a formal curriculum in the belief that the students would provide one from their work experience. Chris explains: "We expected them to come back full of questions; but because of the difficulties we had placing them, that never really happened. We found we couldn't arrange the mornings around the afternoons in the way we had at first hoped."

The MASH team's experience has been that a curriculum does not just grow out of a work-experience scheme. The exception has been the counselling aspect of teaching, talking to the students about the problems of placement, and particularly about the difficulties they met working with people who were mean to them, and about their frustration and disillusion at finding themselves in routine or boring jobs. The academic parts of the curriculum, however, just did not seem to evolve as readily as the designers of the scheme had hoped. The unresolved problem that remains is how to generate a science curriculum (or English, or math, or history) that is integral to the programme.

The two science classes I observed were in many ways relevant. Reviewing the topic of infectious diseases, Chris saturated the lesson with examples, from Legionnaire's Disease to Salmonella. He constantly explained things in everyday terms and with reference to hospital procedures with which the students were familiar. Yet the impetus and direction came from him; and although highly embroidered, the basic source was still a text book. Perhaps inevitably the students displayed the characteristic inertia and behavior of the classroom. (Exaggerated perhaps by having worked late into the night in some cases.)

"We thought experience would provide the questions and give the impetus to the curriculum," the English teacher in the programme explains. "In that way we could be sure that what we did was 'relevant,' and interesting, and useful."

"That didn't work out," says Chris, "and so now we have to create the energy and interest and enthusiasm here in school. And that is difficult to do as long as we are still inside and part of the institution, because the atmosphere we try and create here quickly gets dissipated."

He summarises the current status of the Alternative Programme; "Well, instead of the environment providing the input and the impetus to the curriculum, it has turned out the other way 'round. Now we not only have to teach them science, we also have to see them through the work experience. And we still haven't solved the problem of how to teach them science."

It would be wrong to be pessimistic about the programme at this stage. It may not have achieved what it promised, but it has got part of the way. My purpose in writing about it rather critically is to emphasise that the idea of "relevance" was used to attack the notion of schools as sources of culture, and to attempt to put them in a service role. The experience of this programme, however, has been that in some ways school has a greater potential as a source of human energy and motivation than the world of work. It would be a mistake to generalise too far from this point, but the point indicates an interesting, and for the schools, challenging direction.

(Note: An important element in the story is that Chris himself works in one of the nearby hospitals after school. In the way I have talked about the programme, it didn't seem appropriate to mention it; but my intuition is that it is a key fact in understanding the successes of the programme.)

The Urban Studies Centre

The Urban Studies Centre describes itself to potential students in the following terms:

Urban Studies is an innovative, alternative approach to education operated by the high school. At the Urban Studies city-wide resource centre, located in the political and historical heart of the city, students will study basic skills, will explore their own career potential and will utilize the resources of the urban environment. Frequent first-hand contact with the people and the places of the city and wide use of audio and visual media to communicate the special meaning of the city make this programme unique, timely and important for young people who are committed to the goals of the programme.

The location turns out to be the top floor of an old school building currently housing part of a school under construction and other fringe activities looking for a home. No one in the building seems to know what anyone else is doing, which means students drift into Urban Studies from other places on occasion. Nevertheless, this is some kind of home to its students. The ones I talked to say how much better it is here than in the main school building. Here they belong, they know everyone, they have a place they can go and call their own. The teachers admit that some of the students are refugees from the size and scale of the ten-story building two miles down the road. As a visitor, I am struck by how much easier it is to talk to students here; two or three people tell me their life stories.

The teachers don't identify themselves by subject to any great extent. To some degree everyone teaches everything. The science teacher has a special interest in environmental studies, but he also spends much of his time with photography and television (one of the programme goals is that students should leave the Centre knowing how to operate and use a video-tape recorder). The morning I visited, he had all the students reading the morning paper and composing their own obituaries in the house style.

Relationships do seem qualitatively different here. Because there are no bells ringing, no mass movements of students, no pressures of things that need doing or places to get to, people seem to have more time for each other. There is a kind of celebration of the individual that is only possible in a small and intimate social enclosure. (People often talk of student:teacher ratios, but these are meaningless considered apart from the total size of the institution. Big institutions simply generate more things that need to be done, and more specialists, who by definition do things no one else knows about.)

Two senior students are talking to one of the teachers in a hallway. They are thinking of going to night school, both to pick up more points and to "keep clean." The teacher refuses to 'phone up for them. "I don't want to go to night school," he says.

> *I did it and it was a mistake. You think school is bad? I'm telling you night school is worse. The 'phone is in that room. Give them a call. Do it now. Not later. Now. Just don't ask me to do it. I've done my time. Go on, give them a call. Until you know what they are offering there's no point in even thinking about it. You can't even discuss it until you know what the options are. Call now. Use my name if it helps. Just don't ask me to do it because I won't.*

This brief encounter seems to illuminate the style of the place. Informal and humorous but with a relentless insistence on self-reliance. You can expect support and friendship from the teachers, but you have to expect to be independent; and that is probably the key fact that differentiates it from the main school, despite the complementary rhetorics of each institution. For despite the interest that the principal takes in what goes on here, it is clear that most teachers think of Urban Studies as some exotic (and perhaps for teachers, easy) option. The students, too, think of each place as different.

The scale is human rather than organisational, and that has some drawbacks. It makes it difficult to get away from people and means that in terms of formal curriculum choices students are in some ways limited (though many go back into the main school for various courses). Interestingly, the number of apparently college-bound students opting to come to the Centre seems to be increasing. Some students say it is difficult going back into regular high school courses after the independence of life in the Centre.

One of the teachers who has been here since the beginning claims that survival is the best test of alternative programmes. "We've been going six years, which is a long time in this business," he claims. He goes on to direct a specific plea to the NSF. "The foundations have never really supported alternative programmes within the public school system to any great extent. They have only supported private ventures designed for a small number of special kinds of kids."

Comment

MASH and Urban Studies indicate some of the ways the high school has changed in response to the educational criticisms of the past decade. It might be said that both are add-on responses and the school itself remains unchanged; but this is an open question, and simply the existence of the alternative programmes indicates that there is some cultural dynamic in the organisation.

It is perhaps important to note that where the curriculum reforms of the sixties found their main audience, and made their greatest impact, was on high status, high income, middle class school systems (witness PSSC, Chem. Study . . .). These were, after all, innovations that belonged primarily to elite groups: to the universities, the foundations, a few exceptional schools. In contrast, those innovations that have been developed from within schools or school systems seem to have been primarily of an organisational or administrative character. (And often directed at the powerless, the poor and the working class.) In both MASH and Urban Studies, curriculum issues, although they have been considered important, have been left to be thought out ad hoc, and secondary to more pressing organisational problems.

In the case of the high school, considering things in retrospect, it is clear that organisational changes have made a greater impact than purely curriculum changes. (All that is left of PSSC is a small collection of equipment in a prep room and some memories.) However, that doesn't mean that curriculum questions have been answered or that the issues have dissolved. In fact, the greatest successes seem to have come where both approaches have coincided, as in the conjunction of the ninth-grade cluster programme and the writing workshop.

ALTERNATIVE 2: BEYOND THE CLASSROOM DOOR

When you see things in yellow light, everything looks yellow or some shade of grey and black. In white light you can see all these different colours. They used to have street lights that were yellow like this, but people really didn't like driving along in yellow cars full of yellow people. So a light was developed that was almost white. But it wasn't quite white, it fooled your eyes into thinking it was white. If you look here you can see that it is mostly yellow and blue. Which rainbow colour is missing? Red, that's right. If you look at my face you can see it looks like I've been dead for two weeks. That's because my skin is reflecting blue light but not red. If you look up there at that ring on the wall, watch what happens to it when we go from this light to real white light. See, it goes from brown to red. (The children gasp in astonishment.)

The curriculum and the text are conventional enough and typical of many science classrooms, but the setting is different. Nearly 300 fifth-grade students and their teachers (from a number of city schools), are seated in an auditorium at the Science Museum watching a programme called "Good Vibrations," about the wave characteristics of light and sound.

The presentation is carefully assembled and well-rehearsed and it seems to capture the interest of the children. Once or twice the excitement of a few bubbles over and they have to be quieted down, but most of them are attentive and intrigued.

The programme is presented by a young man who succeeds in giving the impression that these are things that interest him. It is as though he is giving you a glimpse of his world rather than presenting something external and objective. Although there is a considerable element of showmanship built into the programme, it never reduces itself to a set of tricks and gimmicks. One of the teachers says afterwards, "He's more like another teacher than an actor."

The machinery is impressive: a sound synthesizer coupled to TV monitors, street size ultra-violet and sodium lamps, a double bank of coloured lights some ten feet tall triggered by different sound frequencies, and a burglar alarm which detects movement by ultra sonics. (One volunteer comes on stage and has to creep up on a balloon and burst it without setting off the alarm. To help her she sees her movements graphed on a TV monitor. Then the monitor is switched off and the children have to shout directions to her from another monitor only they can see.)

High frequency sounds show, to the children's delight, that they can hear things their teachers can't hear. "Just learn to talk in those sounds and you can talk all day in class without your teacher hearing you," suggests the programme presenter.

The presentation climaxes in a recording of the Beach Boys' "Good Vibrations" made visible both on the TV monitors and by a laser beam projected onto a speaker mounted at the back of the stage.

All fifth-grade students in the city come to see this presentation sometime during the year. I asked some of the students before they went in, if they knew what they were going to see; but no one had any idea. Most had been to the museum before with family or friends but couldn't remember much about it. (One girl suggested "Escalators, and a big balloon.")

I asked two of the teachers whether or not they planned their teaching around the visit at all. They said it was difficult.

There was so much to see in the museum and children's interests were so different; some were most interested in animals and others in something else. "A few years ago," one teacher explained, "city schools were very keen on science and we did quite a lot. Now the pressure is on reading and basic math. We have such a mixture of students in the school that we really have to concentrate on those things." The time this teacher has to give to one student during the museum visit illustrates the point. "He's a special needs student with a lot of problems: learning problems and emotional problems. I have to watch him because he might get into trouble just because he doesn't know better. We have three or four such students in each class."

After the presentation, the students disperse around the museum in small groups. "Three thousand is the most we let in," explains one of the education department staff, but most days there will be perhaps half that number." "I love to watch them," adds a colleague, "they smother the place." You can see what she means; everywhere you look there are little groups of children.

In the computer section the visual display offers you a choice between playing games, doing numerical calculations, or obtaining information about other museum exhibits. You select the one you want by pressing a single letter on the keyboard.

A boy, perhaps ten years old, stands in front of the display randomly pressing buttons, apparently confused that nothing happens. When he moves on, a high school student takes over. He, too, presses keys at random until a younger boy behind reads out the directions. The older student presses the key for games and is offered a choice of some eight alternatives. He wants tic-tac-toe, and presses the two keys that identify the programme. However, he presses the keys before the printout is complete, and each time he does so the moving spot returns to the start and delays the sequence. Increasingly frustrated, he starts pressing keys virtually at random, exacerbating the problem. Finally he pauses looking puzzled, the printout completes, he presses the keys and proceeds with the game. . . . Looking around the other terminals, it seems everyone else has chosen to play tic-tac-toe . . .

The area of the museum that deals with wave movements is darkened and spacious. In an open area under a spotlight is a large sand pendulum hanging over a slab of slate about one metre square, and set in a square trough about the same height above the ground. (There's a ledge, so small children can reach.)

On the edge of the trough are instructions. (Clean the slate of sand. Hold your finger over the nozzle of the container. Sieve sand into it. Hold it over the spot marked on the slate. Release it. Do not push it once it is moving.) You have to do these things in more or less the right order, and if you leave any out it doesn't work too well. The scale of the apparatus is such that it takes two or three children working in co-operation if it is to work. In addition, there is no clear goal in sight; for unless you've seen it before, there is no telling what it is going to do. It is interesting to watch what children make of it.

Three fifth-grade boys rush up to it, set the pendulum swinging, run sand through their fingers and then rush on to the big wave machine (a giant water tank with waves running through it).

Five girls, about the same age, cluster around the trough. One of them, Ann, quickly realises that the nozzle is blocked with grit and sets about clearing it. She gets it working and sets it swinging. "Oh! it's making a banana," one girl says. "A bunch of bananas," adds another. The cannister runs out of sand. Ann catches it and, with another girl, starts to refill it. The others wipe the sand off the slate with their hands. It quickly gets blocked again. Some of the girls are playing with the sand and tipping it on the slate faster than it gets wiped off. The teacher arrives and helps them sort it out by restoring some co-operation between them. "Hold it over the spot," she says (the teacher is the only person to read the directions). The spot is in one corner obscured by a patch of sand, but they think it is in the middle. The pendulum hangs there making a pile of sand. When Ann reaches out to push it the teacher stops her. "It says don't push it," she says. "What does it prove?" The teacher continues in response to her question, "that the earth is moving." Someone wipes sand from the corner and they discover the spot. They set it going, but after two oscillations the nozzle blocks again. Some of the girls drift off and the teacher follows. Ann wants to try again but everyone leaves. She stays a second longer, then rushes off to join her friends at the next exhibit.

The Wang computer is a little like a pocket calculator. On a table is a central electronic unit and around it a number of small terminals, each with a chair. There is a long set of directions you can work through to explore the characteristics of the machine.

At one terminal a boy sits filling up the display with digits and then clearing them. After repeated attempts he tries the other keys, add and subtract for example, and seems puzzled when nothing happens. The other functions (like squares) are more rewarding. When you press those the numbers move.

A small black boy comes running past, furiously mashes as many keys as possible, and darts off to another part of the museum. Hard behind him comes a teacher. "Come on," she says to the boy still sitting at the terminal, "keep up with us."

A large bearded man wearing glasses is sitting up on a dais in a corner of the museum. Next to him a column emits lightning sparks. As he talks, the flourescent light tube he is holding over his shoulder glows, even though it is not connected to anything. "If you had one of these in your house," he explains, "you wouldn't need electric wiring. You could just hang fluorescent tubes up with pieces of string, or stick them in flower pots." He goes on to explain that really the apparatus doesn't have much practical use except in research and Hollywood horror films. But a good bit of the time he tells stories about the man who first did these experiments. Nikola Tesla. "He used to invite people from industry and foundations who were sponsoring his work to visit him in his lab; and when they arrived, he'd have sparks flying everywhere. Everyone would be terrified, but he was always quite calm and cool because he knew what was safe. Once he had a gigantic spark that used up so much electrical energy that he burned out one of the generators at the power station in Colorado Springs where he worked."

The fifteen or so high school students sitting on the floor in front of him listen intently. Other people passing by stop to listen. Three museum attendants also come over to listen. Again there is a feeling of here is someone talking about something he really cares about. The eccentric figure of Tesla isn't just a joke or an entertainment, but someone the speaker feels some affection for, and perhaps identifies with to some extent.

The education department of the museum has a staff of eight who, between them, put on twelve programmes like "Good Vibrations" and a further twelve in the planetarium. These programmes cover the age range and subjects from insects to organic chemistry. The department also arranges Saturday morning classes (twelve in a series), lectures, short demonstrations like the one on Tesla coils, and an afternoon session for elementary school teachers.

The education department's aim is to produce programmes that are entertaining but which convey, as effectively as possible, key scientific ideas. Although they are carefully planned and well rehearsed, most of the staff like them to be interactive rather than simply expository.

Younger children dominate the clientele. "More than 65% of the students are from grade seven and below," estimated one member of the department. All students in the state are allowed one free visit per year, and teachers have free access to the museum, so the museum has a claim to being a significant element in the science curriculum of the schools. The education department is in an uneasy position, being closer to the audience than many other members of the museum staff, yet generally treated as service unit rather than central to the museum's function. Some members of the department would, nevertheless, like to work more closely with the schools, and sometimes feel a little frustrated at the limitations of forty-five minutes' contact with students they don't expect to see again. All the staff

seem confident in their programmes and feel they are effective in getting across to the students. Many feel that is achievement enough (including the minority who come from a school teaching background), and suspect that their effectiveness is in part a function of social distance and limited contact. (Contact with schools is being extended through a magnet programme which brings particular schools into the museum more often [six times a year], and takes museum staff out into the schools.)

The in-service course for teachers is well supported (seventy-seven teachers this session). This year, for the first time, it is run in conjunction with a university, which offers two hours credit for the course. The prospectus describes it as offering "science ideas, activities and materials that have proved effective with elementary students, and is designed for the teacher with a limited science background." One of the staff describes it as aimed at "bolstering confidence." "Most of the teachers are women teachers who lack confidence in their own knowledge of science. They wouldn't have the confidence to sign up for a course at the Science Centre in CIS, but they will come here because it is neutral ground. We give them a shopping bag of things to take back to their classrooms to get them started."

Daniel grew up with the curriculum development movement. For five years he worked for EDC, first on Elementary School Science, and later on the African Primary Science Project. For the last few years, though, he has been working at the Children's Museum, an unusual and exciting place, part museum and part pre-school play center that occupies an old house in the city.

In the Science Museum the focus is clearly on science and things scientific; but in the Children's Museum, a smaller scale enterprise, the emphasis is firmly on children. The attendants are mostly young teenagers, and the clientele seem mostly in the three to twelve age range.

In educational terms the Children's Museum is a place that stresses learning rather than teaching. Daniel articulates his own philosophy eloquently:

> *I think we in America expect too much from our schools. The way I see it, there are two distinct systems involved in education. One is the learning of ways of conceptualising and categorising: what Bruner calls, "learning how to learn." The other is the development of personal metaphors for understanding the world.*

He thinks these two systems are really at odds with each other:

> *I don't think schools, or perhaps any other institution, can cope with the demands of both systems. Schools may be very good places for learning symbol systems for learning how to communicate, and for learning how to survive in our kind of society. They just seem to be rather poor places in which to learn science. The two different systems just are not compatible with each other. Learning in the sense of realising personal metaphors for understanding the world is, I think, best accomplished in more intimate social contexts than you find in most schools.*

Daniel says he has been aware of this tension for some time; even in ESS there were some people who wanted to teach a particular concept, and who looked to the project for ways of illustrating or demonstrating it. Others, like Daniel, wanted children to learn from play; to be genuinely exploratory and to work from their experience of materials. Now, some years

on, when he looks at the schools he finds it is the analytic, conceptual approach that (at best) dominates the curriculum. "I've given up on promoting play in schools," he says, smiling sadly.

Those who believe that the curriculum reform movement has failed to transform schooling still tend to see things in terms of schools and classrooms, Daniel, however finds himself increasingly turning to other, less formal and often less formalised settings in which to pursue his ideas. He believes that "schools cannot totally educate a child," and that much of what we learn, especially in the way of learning "personal metaphors for understanding the world," comes from settings other than school. He sees the best opportunities for the kinds of relationships and the kinds of learning he wants to develop in various forms of after-school day care; community centres and youth groups, for example.

In trying to explain this to people, he says the most difficult thing to establish is that such formally non-educational settings are conducive to real learning. "Some people seem to think that school is everything," he explains; "that school, and the school curriculum, contains everything that you learn. But I am inclined to think there's a lot you learn that comes from outside, but that we don't know how to recognise and use it."

A similar critique of schooling lay behind many of the free schools and alternative schools of early seventies. But Daniel's criticism of the public schools is not so much that they are wrong, but that they are concerned with different kinds of learning than those he thinks are important for personal understanding. To create new institutions, he feels, is not necessary; it would be much more effective to use what already exists. There are a wide range of existing and emerging groups and institutions, from Boy Scouts and 4-H to community centres and playgrounds, all of which have considerable educational potential. The problem is not to change organisations but to strengthen and "beef-up" what happens in those that already exist.

"You can spend a week and a half blowing bubbles in a community centre, and no one cares. But when I was teaching I once had a junior high math class blowing bubbles and had the parents 'phoning up the school to say that it wasn't their idea of what math was." Once out of schools, Daniel feels, a lot of the pressure to teach is lifted, and the kind of informal relationship that results is actually one that is much more conducive to learning than that which you usually find in a classroom. "Nevertheless," Daniel smiles, "a lot of my friends think I take the Boy Scouts too seriously."

Some of the education department in the Science Museum feel they could be more effective if their contact with children were more prolonged. Daniel has been able to work out some ways of doing this, partly through magnet programmes in the schools, but more often through extra-school organisations. The difficulty he has is partly one of funding; for unlike the Science Museum staff, he lacks a tenured job and a full-time salary, and has to look for grants and write proposals. "For such political reasons," he says, "I have to spread myself more thinly than I would like."

One project that has worked out well has taken Daniel back to considering the problems of teacher development. As part of his work with the Museum he runs workshops in science for people who work with children. Many of those who come are teachers, and at one time Daniel found that large numbers of student teachers from one of the local universities were signing up for the course, apparently as refugees from some of their formal courses. Daniel approached the university and worked out an arrangement whereby they pay for one and a half days a week in exchange for his running courses in elementary school science for their students.

The courses he runs are essentially practical: "You have to remember that most elementary school teachers are women, and it seems in our culture it's harder for women to play with materials in a problem-solving kind of way." Intimate first-hand experience of materials ("playing") is important to Daniel's view of what learning science involves; "but," he explains, "the science I am concerned with is science with a small 's'. It is finding out about the world in a playful manner. What you usually get in schools and colleges is science with a big 'S', which is concerned with concepts and categorisations and the relatinships between variables."

He feels it is important to approach the experience of materials through aesthetics rather than explanation. He stresses the ordinariness of many of the things he uses: starch, soap bubbles, milk cartons. "You've got to get teachers confident enough to play with materials," he says, "because they have got to be confident enough to get the materials into the hands of the students, and to tolerate them playing around with them." "Perhaps," he suggests, "if the NSF is serious about wanting to improve elementary school science, they should consider supporting the Women's Movement; at least until we get more men into elementary schools."

Around the room are some examples of the work that is going on in Daniel's courses. A tray of starch that has dried out to leave characteristic crack lines. ("It looks random at first sight, but there are some interesting patterns. Notice how the lines are mostly perpendicular to one another.") In a plastic bucket is a water wheel made out of milk cartons. When the wheel turns, it winds up a winch. (First of all you just play with it. Then you find, "Does it go further if you tip a cup of sand in slow, or fast? Do two cups wind it twice as far as one cup?" Once you get started, there's no end to what you can do.)

The problem with most teacher education courses, and with in-service courses, lies in the implicit view they have of the teacher. "Most of the teacher institutes I have had anything to do with," Daniel says, "have been concerned to promote or to implement some already worked-out curriculum. It is very rare for the people who are running them to find out where the teacher is, and start from there."

Specific Points of Recommendation from Daniel to the NSF

1. Consider the educational potential of existing after-school day care facilities. (In this city the early school hours brought about by busing have been a factor in increasing the demand for such facilities.)

2. Consider also the educational potential of other non-formal organizations like youth groups, the Conservation Corps, Boy Scouts....

3. Look more closely at the design and use of children's toys. Commercially available toys are increasingly programmed to a limited and restricted number of uses. This may be a more invidious influence on children's development than the often quoted effect of TV.

4. The problem of designing or providing toys for the handicapped provides a particular challenge/opportunity.

5. Teachers (at all levels) need more training in basic craft skills - from how to write at the blackboard, to 1001 things you can make with a milk carton. Knowing how to present children's work/ideas is a particular problem.

6. Despite the pressure to prune educational budgets, inservice education for teachers should be strengthened and supported. Decreased turnover and recruitment, and teachers staying in the same jobs, will be a key factor in the forseeable future.

7. Most elementary school teachers are women. The Women's Movement has a lot to say about the relation of women to science, and this should be taken more seriously in considering attempts to improve science education.

8. In-service education should start where the teacher is, not where we might like her to be.

BACK TO THE BASICS

One of the recurring themes as teachers (in science and in other subjects) talk about their students is the level of their reading and writing abilities. Some simply complain, feeling the fault lies elsewhere (in the middle and elementary schools, in the English and remedial departments, in the home, TV, comics...). Others, like David, feel that it is part of their job to make up or correct whatever has gone before, hence his emphasis on the written lab report. During the course of the study, Gordon Hoke wrote from the AASA Conference in Las Vegas reporting an NIE Study which showed "writing" as a critical area in which teachers felt standards were falling. (See Hoke's memo 3/3/77 in appendix.)

In this section I want to document this important distinction between the teaching of reading and writing as a specialist's field and the task of particular experts, and the idea of "every teacher as an English teacher." Both approaches are present in the high school in the form of complimentary innovations; and though examining them takes us out of the science department, the subject is certainly one that science teachers in the school consider vitally important.

The Reading Lab

The atmosphere in the reading lab is different from that in many classrooms. Students come in, pick up a file by the door and settle down to work in one of the language-lab type carrels. The teacher and the classroom aide move quietly and easily, seeming to be well on top of events and hurrying through the extensive paperwork the system generates. Sometimes at the start of the lesson there are signs of the characteristic "sitting around and goofing off and socializing" you see in most classes, but most of the time the feeling is of time being used intensively, of quiet concentration, efficiency and productivity.

The lab was designed by and is serviced by a private company in close consultation with a group of learning psychologists headed by B.F. Skinner. The work is divided into units and every ten units the students get a "free" period in which they can read magazines or play table games. After thirty units, and again after sixty, they receive a small signed certificate, not unlike those cents-off coupons you get for buying soap powder or dog food.

Bernie, the teacher in charge of the lab, describes some of the features of the system. It's good at placing students in terms of skill level, and it's good at diagnosing specific difficulties and providing specific help (for example, for students who have problems with long and short vowels). Most of the students who come through the lab are in the ninth grade (about two thirds), and sixty per cent of them are in the lower two thirds of reading ability when initially tested.

In most units students work from a cassette tape and work sheet, marking answers on a multiple choice sheet with a special marker pen that reveals true and false answers. It is possible to cheat; for by taking two answer sheets, students can use one as a trial and error test sheet in order to turn in a perfect copy. The classroom aide, who checks answer sheets and helps students with queries, has become adept at spotting cheating. "A lot of what I do is counselling," Bernie explains; "I tell them there is no point in cheating here; that they are only cheating themselves. I try to get them to be honest with themselves and take some responsibility for their own learning." (On the blackboard is inscribed the message: "Cheating on your tax return is dangerous. Cheating in Reading Lab is ridiculous.") For the students there are other ways of getting by. Another message on the board reads: "Music tapes will be confiscated until June." "Some students would bring in tapes to listen to; one even stole one of our tapes and recorded music over it," Bernie says; "but you could always tell. They were never able to sit still."

He admits that to some students the lab is a refuge:

It's one of the few places where it is quiet, you can sit down and no one will bother you. Sometimes we get students who will come in, put the headphones on and close their eyes; and when you look they have no tape in the machine. If they have been from lesson to lesson and had teachers shouting at them you can understand that. Another student who comes is an older, apparently college-bound student who doesn't seem interested in anything since his friend was killed in an automobile accident. He doesn't go to many classes but likes to sit in here with the headphones on.

The lab is currently under financial pressure. It was installed less than a year ago on the initiative of the school department and against the recommendation of the principal and the English Department (who had an alternative proposal). It must have been expensive to install (I couldn't discover the dollar cost), and been seen by the company that produces it as an important contract (a recent Company Newsletter features photographs of the superintendent talking to Skinner).

Although teaching of the basics is a priority for the school system superintendent, the school board is under pressure to cut the education budget in the face of inflation and political demands. Currently they are considering closing the reading lab (which in this school costs around $10,000 a year to run), unless it can be shown to be cost-effective.

Bernie finds this situation uncomfortable. The gains on test scores are not dramatic, but he believes that a poor indicator of the effects of the system. "I don't want to make any grand claims for the system," he says, "I just know at this time, with these students, in this school, it works." He amplifies the point by asking how success can be judged or measured and what kind of comparisons make sense. "Compared to what went on before the system, compared to what we could do without it, compared perhaps to what goes on in other classes, I have no doubt that it is worth the money it costs. How do you measure it? Against how well children read? Against their attitude to reading as a whole? Or against the chances of them cleaving somone's head in?"

A lot of their success, he feels, has been with students who had got to the point where they wouldn't read aloud in class (and turned hostile when asked), and with students who have severe perceptual handicaps. Such students seem to respond well to the closed learning environment and the depersonalisation that results from separation of the teacher from the source of knowledge.

Clearly that is going to be a difficult case to make out to a school board hard pressed to justify inflationary budgets. (The loss of the investment cost as a criterion

pales into political insignificance when set against the proposal to cut up to 410 teachers from the system next year.) Changes in atmosphere, climate or attitude are notoriously hard to measure, and their effects even more difficult to assess. Yet most educationalists habitually judge a school or a classroom by such elusive or subjective criteria in the absence of any more effective measure.

Behind Bernie's doubts about the measures used is the certainty that cost-benefit analysis is not being used to decide between alternatives, but simply as source of justification for making cuts. If the school loses the reading lab, it is unlikely to be able to use the money in another programme.

If criteria like attitude and climate are used in judging the success of the reading lab (or any other class), it is important to include the teacher as part of the subject of the evaluation. Is Bernie a reliable source of information? He doesn't seem to fit the stereotype of the ed tech learning scientist, or of the ambitious teacher riding an innovation to a brighter (personal) future. He lacks that air of loyal dedication to the system, and the bright light in his eyes when describing its virtues, that characterise the true devotee. Indeed as he describes how he came to the job, it seems that only gradually has he lost a sense of some distaste for the philosophy and style of approach that characterise the lab. Bernie's background is English ("Ultimately, I think getting students to write is more important than getting them to read"), but he also has extensive training (to PhD level) in educational administration, organisational theory and group behavior. After taking three years off to attend university, and unable to find the administrative job he wanted, he came to the school last year as an English teacher. Having chosen the job with some care, he says he was upset to find that the computer printout assigned him full-time to the reading lab. (Not a good start to a marriage with a new technology.)

After five months working in the lab he has modified his view of it. He still does not want to stay, even if he remains in teaching. "I am an English teacher," he says. "I like to teach a class. Here you never get the chance to be a performer." He also finds the highly structured nature of the materials somewhat limiting. "I suppose I could add to it, and improve it where I think it needs improving, but there is a limited satisfaction in that." Although he feels little personal stake in the future of the sytem, he feels he wants to defend it on its merits. Given the history of the innovation it is not difficult to find people who criticise the lab, mainly on the grounds that it failed to hold the low achieving ninth-grade students teachers feel it was primarily intended for. The head of science perhaps put Bernie's position best when he said, "Any teacher doing something they think is worthwhile gets to believe in it, and hates to see it go. In teaching you can't separate the person from the job like some administrators seem to think you can."

Sidetrack

I spent a morning with Hassler Whitney, mathematician and consultant to the project, in an elementary school that had the same learning laboratory system installed, both for math and reading. The school was apparently pleased with the system; certainly the teachers running it said they would not want to go back to regular class teaching (despite the mountains of paperwork). One of the other teachers, though, a math specialist, said he feared that the effect of the system was to threaten the expertise of the class teacher, a trend that already existed in math and which the lab reinforced; and he wondered about the long-term effect of this on the students.

Driving back across the city with Hassler, we were talking about these things, and trying to get some sense of what it was like for a student to learn math through such a

system. Hassler was explaining to me how much of the students' time was in fact taken up trying to understand what the question was that they were being asked, rather than in any direct confrontation with mathematics. Suddenly he broke off and started telling me a story.

> *When I was a student I once cycled three miles to this street to see the number plate on a taxi. I was playing a game with myself where I was trying to collect the longest sequence of numbers I could from car license plates. I'd got to over 1,000 and I knew that there was a taxi that parked near here that would give me two numbers at once. What were the numbers?*

I thought for a while and suggested 11112, which would give 1111 and 1112. "That would be fine," said Hassler, "except that I hadn't got that far." For the next few minutes I thought around the problem and then went silent hoping he'd forgotten what he'd asked. After a few minutes' uncomfortable silence he asked me, "How do you feel about my question?" I confessed I was rather bored with it, felt he was playing games with me and I rather wished I could just guess the right answer or that we could talk about something else. "Now you know how those children probably feel about math," he said.

The Writing Workshop

The writing workshop is an idea and an approach rather than a place, and that makes it rather more elusive to describe. It seems to have grown out of the unsuccessful proposal made by some of the English teachers before the reading laboratory landed in the school, but has been developed in association with a number of faculty from one of the nearby universities.

The writing workship involves the ninth-grade English teachers. Although there are five such teachers, I talked only to one, June, who works on the same cluster team as Steve, the science teacher, and Dennis, the civics teacher.

There are no tricks and no technology to the writing workshop; not even any books. The idea is so simple it is difficult to describe and make credible. Yet it has a distant reality to both teachers and students, many of whom are highly enthusiastic about it. June has been teaching in the city for a number of years, but says this scheme has made it her best year yet.

The basic idea is for the students to write about the things they know about, and they progress from topic to topic starting by writing about someone they know, going on to describe events they have seen, to give someone instructions for carrying out a task, to describe a place, and so on. The list and sequence of topics is flexible and adaptable. As each student writes about each topic, they duplicate and collate the class's work in the form of a booklet.

It sounds a simple process but it has generated considerable enthusiasm. Students enjoy reading each other's work and look forward to each new topic. There is a feeling of corporate achievement and a developing sense of aesthetic standards. Both teacher and students are surprised at the quality of some of the work.

The class I observed was quiet, almost reverent. Throughout the lesson June went 'round the class talking in a low whisper. Primarily students were concentrating on their own work, though there was some exchange of writing and a little whispered discussion. One girl found it hard to concentrate, suddenly started writing furiously, and after covering two or three sheets of paper tore it up; but she failed to distract the rest of the class.

June said that all it took to start was two university faculty working in the school for two days getting the students started. Since then, supplies of paper and duplicating fluid permitting, it has continued to run smoothly.

The real test of the scheme is probably whether it will carry over into other classes. Its location in the clusters and the establishment of the daily team meetings would seem to promise well.

TWO STUDENTS

Helena

Elaine, or Helena as she sometimes prefers to be called, is in ninth grade. Most of her life she lived in California, where she mixed with a number of Chicano students. She says she still speaks "street Spanish," though not as fluently as she once did. "There was a time when I'd have to stop and think what language to use. Someone would ask me a question and there'd be a long pause before I'd answer!" When she's talking to other students you can still hear the Spanish intonation in her voice.

Helena is sixteen, having repeated a grade earlier in school. "I goofed around just like you see most kids doing." But now she feels straightened out, values what she gets from school and wants to make the best she can for herself from her education. The way she says it, it seems both an emphatic and fragile resolution. "I used to goof around but now I get straight A's. I like science best (because she thinks highly of Steve as a teacher), but my ambition is to go to Art College."

Helena seems unusual amongst the students in believing so strongly that school and education have something to offer to her. It's not just the job prospects she values, but the process of education itself. "I like to know things," she says; "When someone uses a word that no one else understands, but I know what it means, then I feel good. I like to be knowledgeable, to be someone that people know they can ask when they want to know something, whether it is the speed of light, or whatever it is."

The cost of being interested in education and valuing what the school has to offer is that it has cut Helena off from the social life that permeates school for most students. Helena says she doesn't mind being considered odd in this way. She says she doesn't have much time for students who treat school as a "fashion parade." "They spend all day criticising each other, saying, 'Ooh you've got too much makeup on!', or 'That skirt fights with that blouse, couldn't you get a better colour?'" That kind of thing is petty, she feels, and inappropriate to school. She comes to school in blue jeans and a shirt because she comes to work. "In the evenings I'll get dressed up if I'm going out somewhere, but I'm not coming to school in a fifty-dollar shirt."

Helena is articulate and headstrong, and some of the other students seem to find her a little overwhelming. She needs the attention and praise of adults to support her moral stand against her peers. The question she raised for me was whether the students who committed themselves to the explicit values of the school were those whose motivation

stemmed to some degree from their alienation from their peers. Are the students who best succeed in academic terms often those who feel themselves misfits amongst other students?

Tony

Tony is a senior, president of the student council and one of the students most actively interested in science. Last year, as a science fair investigation, he worked on the separation and identification of bacteria. The project was demanding technically and required building a gas chromatograph "from bits and pieces lying about in the lab and any other parts I could persuade companies to give me."

Tony is in some ways a product of the curriculum reforms of the sixties. Unil two years ago he attended another high school elsewhere in the state, where he had been subjected to an intense college-bound curriculum. He took a BSCS advanced biology course in grade nine, and PSSC physics in grade ten. The biology course had included a four-month project. "I looked at photoperiodicity in animals, keeping hamsters under different lighting conditions and recording the effects on their offspring." It was a project that Tony says failed to reveal clear cut results, but led to the accumulation of "mounds of results and about 200 hamsters."

He says he first remembers getting interested in science when he was ten or eleven. His father was then in the Marines and they lived in North Carolina. "I used to spend a lot of time out in the woods; hunting, fishing or just walking about watching animals." He hasn't always seen himself as a scientist, however, for as a sophomore he took a number of language courses; and indeed one of his regrets about his present school is that it offers no way of continuing Russian.

Since coming to the school he has taken to chemistry, and spends much of his time with Jim Kelly. He works in Mr. Kelly's lab as a student technician (for which he is paid $30 a month), but he spends as much time there as he can. Perhaps more than anything else, it is Mr. Kelly's influence that has turned Tony to chemistry.

"He always helped me and encouraged me with my project, sometimes staying till eight or nine o'clock at night." When I asked Tony if he thought of Mr. Kelly primarily as a science teacher, or as a chemist who happened to teach, he said unhesitatingly, "as a chemist." "His home," he added, "is full of equipment. He spends most of his spare time, and a good bit of his salary, reading catalogues and science journals and buying science equipment."

Overall, Tony feels there are a lot of opportunities for students at the school, but that you have to push to get them. Through the flexible campus scheme he is taking a calculus course at a nearby State University, but he says he had to keep reminding people at school about the course in order to get in. "At my last school there were about twenty counsellors, and they kept at you all the time to get college applications in. It was a school where most students went to college and the school was all geared up for it. Here there are only three or four counsellors and most people are very busy. It means you have to do a lot of things for yourself."

Just before I left the school, Tony was offered places at both MIT and Dartmouth. He chose to go to MIT because of its emphasis on project work and teaching in small groups. His aim is to major in chemical engineering.

Sometimes science students are thought to be narrow-looking and not very socially inclined. Tony, though, is president of the student council and sits on a citywide Committee on Bilingual Education. He feels the lack of a social side to the school is one of the weaknesses of its citywide catchment area: "When school finishes at 1:40 everyone wants to go home. There's no neighbourhood feeling for the school. I'm the only one on our street who comes here. Most of the other kids near me go to parochial schools. At my last school it was quite different. Everyone knew what everyone else was doing. School didn't just stop in the afternoon when the bell went."

Tony is perhaps an unusual student. He would probably not be here if he hadn't transferred into a city school, for it seems likely he would have gone to the examination school across the street. However, his story does demonstrate that the school has been able to offer a high level education for those who need it. The question that remains is perhaps where Tony would be if he had spent all his high school years at the school and had missed out on the BSCS and PSSC courses at his previous school. What can be said is that he survived the turmoil of the new curricula and of desegregation with some success and with an education that promises some value for the future.

APPENDIX

To: Several People

From: Gordon Hoke-- 3/3/77

Re: A selective report on the annual meeting of the American Association of School Administrators (AASA), Las Vegas, February 1977

Introduction

Issues of governance and problems of the economy dominated activities. In the opening general session, Ernest Boyer, new USOE commissioner, stated that "education in America is primarily a state and local function. Schools must be run by those who are closest to the people," Boyer continued, "and any move to 'federalize' this essential function must be vigorously opposed." Meanwhile, not far away, Los Angeles residents were indeed bitterly opposing a federal court order to desegregate its schools via busing.

I attended a variety of sessions whose messages, individually and collectively, could be placed within the context outlined above. They are cited in order of presentation.

1) Topic: "How To Regain Pride in Public Schools" Presentor: Ruth Love, Superintendant of Oakland, California public schools. She was the initial director of the Right to Read Program and is black.

A. Dr. Love declared that we are now "asking schools to do things we used to pray to God for." The 1960s War on Poverty did not attain many of its goals, she admitted, but it did open some doors for groups previously excluded.

B. She concluded by warning that "there are still many children who go to school but don't receive an education."

2) General Session--presentation by Carla Hills, formerly director of HUD, and prior to that period, Assistant Attorney General, U. S. Department of Civil Rights. In my judgment, she offered a series of powerful statements.

A. The quality of education in this country is directly tied to the future of urban life.

B. The underlying significance of Brown vs Topeka Board of Education--original desegregation suit--was not grasped: it was seen as an indictment of the South, not as a picture of northern cities.

C. Our nation still possesses "great creative vitality," but the central question facing us is "Will we sustain the effort needed to correct urban ills?"

D. Recycling a city is far less costly than building a new suburb, primarily because the former has all the essential infrastructures in place--e.g., sewer systems, streets, buildings, etc.

E. The answer to better education for city youth is not busing but a willingness to fight for the preservation of our cities. "The issues are not 'conservative' or 'liberal,' they are simply tough!"

F. There are positive signs, Hills stressed, including a new determination to conserve resources, the emergence of women in new roles, declines in family size, all of which reinforce values of urban living; however, she cautioned, there is a desperate need to streamline federal assistance programs created for the cities.

AASA ranks may conceal another problem, one which is common to so many professional associations. The majority of our youth live in cities, but their administrators and problems are underrepresented in the organization. Many of the delegates were from suburbs, rural districts, and small towns. If economic constraints continue to worsen, though, the need for both educational and tax reform could fashion a stronger bond of reliance and understanding across settings.

3) Topic: "Research Suggests These Steps to Improve National Tests" Presentor: Harold Hodgkinson, director of the National Institute of Education (NIE).

A. There is a need to distinguish between declining scores as reflected in the efforts of high school students and those of children in the lower grades whose scores are rising. Also, ACT and SAT scores are dropping, but PSATs are not. According to Hodgkinson, "no one knows why."

B. In a recent survey of college and high school instructors the following observations were obtained.

B-1) About 11 percent saw high school students less well prepared in social studies

B-2) About 17 " " " " " " " " " natural science

B-3) About 33 " " " " " " " " " mathematics

B-4) About 60 " " " " " " " " " writing skills

C. Hodgkinson sees the minimal competency demand for high school graduation as becoming a national trend and predicted it will produce new problems because (1) there is too much focus on easily measured items and (2) legislators are overlooking the importance of normative issues.

D. In the question and answer session, he was critical of test companies for "misusing" their wares for failure to explain tests and test information to students, parents, teachers, administrators and school boards.

4) Topic: "Responsiveness of Schools to Their Clientele" Presentor: Harmon Zeigler, University of Oregon. Zeigler and his associates have been conducting a study of decision-making in school districts since 1968. Initially, it was based on a survey of 100 sites based on a national sampling. They are now working with eleven of that original group, examining activities in each district throughout an academic year (nine months). Tentative findings:

A. State and federal agencies are playing a larger role in determining local policies.

B. The "definition of alternatives"--i.e., establishing the agenda for discussions of policy--is the key factor and this process is fundamentally controlled by the superintendent and his staff. Public participation usually occurs after the agenda has been established.

C. There is considerable variance in the amount of agenda items controlled by the administrative staff--e.g., seventy-three percent was highest, eighteen percent lowest, forty-seven percent average of the eleven districts.

D. Superintendents, Zeigler warned, face more demands for policy recommendations than do most chief executives.

E. Episodes marked by a high level of community involvement in controversial matters, often accompanied by national publicity, do not contravene indicators of low levels of sustained participation, Zeigler urged.

A superintendent responding to Zeigler stated that a truly "responsive" system is founded on the centrality of neighborhood schools, their principals and staff. However, there was no discussion of how busing and declining enrollments, for example, can complicate this approach.

5) Topic: "Equity and Collective Bargaining in Education" Presentor: Myron Lieberman, University of Southern California. Lieberman was one of the first representatives of higher education to enter the field of collective bargaining.

A. He views collective bargaining in education as beginning in 1962. Today about thirty-five states have legislation governing negotiations and approximately sixty per cent of teachers are covered by these statutes.

B. "Equity must take into consideration all advantages and disadvantages of a situation." In Lieberman's judgment, public sector employees, including teachers, are now enjoying a number of benefits not found in the private sector.

B-1) Teachers can affect management, both locally and at the state level, via elections and the political process. Private employees cannot influence their management in this way. Through political action teachers are especially able to influence governors and legislators. This pattern is not true of industrial workers whose activities are governed by the National Labor Relations Board.

B-2) Public enterprises cannot move--as does private industry--to avoid labor demands.

B-3) Public employees cannot be fired without due process; private employees don't have same protection--e.g., teachers want both the right to strike and the protection of tenure. In short, Lieberman argued, although there is great variance among the fifty states, public employees have many statutory benefits without collective bargaining.

C. Public management too frequently buys off current costs, raises in current taxes, by giving handsome long-range benefits in the form of pensions, etc. In New York, ten percent of the state budget is now committed to this area.

D. Lieberman contends that states and local jurisdictions would find it cheaper to grant teachers "easier access" to strike calls.

D-1) Teacher strikes are "political" not "economic" weapons. They apply pressures on management but do not "measureably" affect productivity.

D-2) Enormous amounts of time, personnel, and resources are used up in moving through negotiations, impasse, fact-finding, mediation, etc. "The longer the bargaining process, the greater the likelihood that management will concede ground."

D-3) He regards binding arbitration as a "cop-out" and as introducing a third force into the governance structure. (In Pennsylvania, the state director of labor relations views the results of binding arbitration as "the annual rape of the public purse.")

D-4) Higher education has been of no help to public schools in this domain, Lieberman asserted, and some of its personnel are helping make the "third party" role one of the nation's leading "growth industries."

D-5) Collective bargaining has had a great impact on school policy and practice over the last fifteen years, and teachers have stressed that it has been done in the cause of improving things "for the children." But the political and legal basis for any union, Lieberman submitted, is the welfare and security of its members.

D-6) He concluded by saying that public management groups must get together and organize resources as do their adversaries in the bargaining process.

Summary

There was much talk about local control, but the operation of schools as a system is increasingly affected by influences stemming from their external environment. Collective bargaining, which links local teachers to state and national offices, and federal policy--e.g., desegregation, Title IX, the forthcoming Public Law 94-142 (handicapped)--are among the chief elements. There were indications at the AASA meeting, and in our recent work in Pennsylvania, that relationships between superintendents, boards, and teachers are stabilizing, but there were also signs that the combination of tough bargaining and decreasing funds is directly affecting the curriculum and particularly the ways in which it is delivered. In turn, one of the display booths at the Convention was manned by representatives of "The Citizens Lobby Against Unionism in the Public Sector."

GREATER BOSTON SITE VISIT REPORT

Introduction

On all too rare occasion, a quick visit to a school or classroom results in a written record worth reading. The unusual occurs in Ms. Steffensen's written impressions of a Greater Boston elementary school and a high school. The elementary school as an oasis in a slum is at once supported and challenged by her portrayal. The reader may find it useful to reflect on the fact that some of the children will go on to the "magnet" high school she visited.

The high school is seen as making the best of a difficult situation rather than as the leading edge of secondary education to which the best, the brightest, are drawn. Her view is particularly instructive where it contrasts with the report by the resident case analyst Rob Walker. This brief vignette illustrates the inherent strengths and flaws of case study methodology. It is less a matter of which viewer is right or wrong and more an issue of what is important to the observer.

Patriot Ridge Elementary School

Setting

A terrible area: slums, broken windows, litter, dogs going after garbage. During the course of the interview, one of the guards came in with an axe he had found on the school grounds, an enormous weapon that looked as if it belonged in a museum, certainly not in a school. However, once inside the door the scene is different, perhaps because the first sight is a beautiful display of student-produced arts and crafts which lines the hallway.

The principal conformed to the stereotype I have of women holding this position. She appeared to dominate the school and to have a great deal of authority. After the initial, rather over-bearing impression, I saw her as candid and pleasant.

The first order of business was a meeting with seven teachers, an acting assistant principal and an assistant principal, all of whom are enthusiastic about the school and are good spokesmen for it, and for the open-space classroom in general. The school has 1,000 students. It is in an area that is partially black and was integrated long before court-ordered desegregation in Boston. The school population is down from 1,300 to its present size of 1,000. Now in order to approach a specified balance, a few white students are bussed in. The make-up of the student population is 60% black, 20% white, 20% Spanish-speaking.

Science and Social Studies

I sat in on two science classes at Patriot, one a first "grade level," the other a fifth "grade level." The beginning lesson concerned the rotation and revolution of the earth. At most, about ten minutes of the class was devoted to review of these two concepts and their relationship to day, night and the seasons. The remainder of the forty-minute class was used in coloring a dittoed sheet that had very small pictures representing day, night and the four seasons. The teacher wrote "day, night, spring, summer, fall, winter" on the board. Some of the children wrote "summe," "might" under the wrong pictures. "Fall" was depicted by sheaves of corn. The assistant principal confirmed my suspicion that many of these city-born children would not know what these were.

The lesson was unimaginative, the noise level was very high because of the air conditioning, and many of the children did not seem to be hearing what was going on. Most of the teacher's remarks were inadvertently directed to the right half of the class, which didn't help. I asked a few of the children questions ("What happens when the earth goes around the sun?" "What comes after summer?"). It was clear that some of them didn't know the concepts involved. Others had been able to answer questions. On the whole, the lesson was a coloring exercise and spelling lesson (an ineffective one at that, since the teacher did not catch all the errors made).

One little girl, busily coloring the picture for spring, said to me, "It's stupid, it's all stupid." Where did she get this? She was enjoying the lesson, in spite of the fact that I wasn't. Did it come from her home, the other children? At this point I don't think these words meant much to her. If she says this frequently, it may affect her attitude toward school.

The level five science lesson covered making an electromagnet. The teacher had the children's interest; the class was quiet; it appeared they wanted to do the experiment themselves. The period was completely spent in demonstration, however, so the children were not able to make their own electromagnets. At the end of the period, they rushed over to the assortment of nails, washers, batteries and wires to look them over, and the teacher shouted, "Hands off!"

My impression is that the physical plant makes science difficult at Patriot. The science specialist wheels the equipment from one open-space area to another. Sometimes there is a problem with the elevator. The logistics of getting equipment to the teaching area for several different levels are demanding. The classroom areas are poorly suited to either demonstration or experimentation; it's hard to see and a lot of time is wasted getting things set up. The scheduling of classes also creates a problem. Because the five class groups in an area rotate between two teachers, if a period is missed it is difficult to make up that lesson. Furthermore, homework is rarely assigned since 800 children are involved and the same science teacher does not always see the same children the following week. An additional hurdle is articulation. Because some of the children move on to a different grouping while others remain in the same one at the end of the school year, the science teacher must vary her lessons somewhat from year to year, or she will have students repeating experiments. If she changes too much, though, any articulation that exists will be weakened. There is no text for science; at Patriot they use SCIS and Harcourt-Brace kits.

While the science at Patriot is not outstanding, the children here are clearly getting more than many elementary school children in greater Boston. When I spoke to one of the three science advisors at the school, he said that science education was not "equitable or efficient" in these schools. I could not get him to spell out what he meant by

efficient, but he did say he had "seven times the energy" he was using. As for "equitable," he indicated that Patriot has three science advisors (who report directly to the District Department of Science) and two science teachers. Yet in the district there are very few science teachers; and apparently many of the schools do not use the services of the science advisors, who are not supposed to teach but only to support the teachers. According to the science advisor, many teachers "feel inept" in this area, a comment we've heard before.

A science enrichment program called "Ultra-Science" is presented in the building for Patriot and several other schools. Most of these schools were added this year in an effort to broaden the support base for the program and perhaps protect it against a proposed cut. The children have a half-day of Ultra-Science every five or six weeks. The facilities are exceptional: a child-sized planetarium, a green house and rooms for the physical and biological sciences. I did not see an Ultra-Science program, but the teachers assured me they were good. I asked which program the children were more likely to identify as "Science, the way she is." Most felt it was the week-in, week-out program, not Ultra-Science. The science advisor told me they attempted to have continuity in the Ultra-Science programs, in spite of the long time intervals between them. For example, they are presently studying the zodiac constellations, and the children look forward particularly to the presentation of their own sign.

I sat in on one social studies lesson. These are taught by the individual teacher, and what goes on in the class is up to the teacher. Some are interested in social studies and devote time to it every day; others appear not to. In the class the children had been studying the continent of Europe using a map traced by one of the children, and they were concentrating on England. During the forty-minute lesson the teacher used an overhead projector and a filmstrip. The children were attentive and seemed to be learning. At the end of the lesson, they listed differences and similarities between England and the U.S.A. The teacher told me he had done a unit on Africa, which he had timed to end when "Roots" was presented on TV. He said, "It was one of the best, most successful things I've ever done in my seven years of teaching." He coordinated art with the unit and had the children paint a mural depicting the descendants of Kunta Kinte. They also made masks and constructed paper plants and flowers so the room "looked like an African jungle." Parents who had been in Africa during the war brought in artifacts and talked to the class. Two months were spent on Africa, and the entire continent was covered.

The differences between the science and social studies classes that I observed emphasized again that the teacher is "the magic ingredient." Whether learning occurs or not is directly related to his imagination and understanding of his children. The teacher who taught the social studies class I watched said, "I was enthused about 'Roots' and the unit grew out of that enthusiasm. The children picked up my enthusiasm and they really got into it. But if I choose a topic in an area I can't get them interested in, I move on to another one."

A large number of books are available in each open area: the Fiedler series (Japan, Brazil, The South,...), Ginn (Your People and Mine), Laidlaw (Regions and Social Needs, Social Studies and Our Country,...).

The school system is highly politicized. This generally affects all in-school education, not just science. I will indicate a few of these effects briefly:

1. The following priority in space has been set: 766 children (referring to Massachusetts State Law for Special Education), bilingual program children, Title I children, everyone else. This means that space for the "garden-variety" kids (and science) is at the bottom of the list.

2. The teachers' union is strong and has succeeded in establishing a rule that teachers must not remain more than ten minutes after the last class. The schools empty fast. I asked the principal if there was any informal follow-up on the children and she indicated this was not possible because of time restrictions. The only ones they see are those who skip school to visit at Patriot. "I say to them, 'Besides being truant, how are you?'"

3. It seems very difficult for the schools her to get good newspaper publicity, but there is plenty of coverage of anything bad. For example, the above-national-average reading scores at Patriot were not reported, but the fact that a number of knives, brass-knuckles, etc. were collected was reported, with the important omission that these were gathered over a two-year period. In 1975-76, Patriot had a state grant to prepare a circular. It was distributed in the community by the students and teachers. Although the financial support did not come from the School Committee, that group did not approve the request for funding of this publication for 1976-77. Everyone is very discouraged about the situation. The school has stopped sending news items to the papers.

The High School

Quick Impressions

I sat in on five classes, two of which I would rate as disasters. The teachers lost control of the classes and there was little learning going on. A third class of the five, world history, was devoting fifteen (!!) class periods to an experimental program being developed by a major university--Life-Work Analyses. While it certainly is valuable for students to get some insight into possible career choices, one would question devoting three weeks of a world history class to this, especially since work on this was going to be included in their history grades. The students clearly saw the program as not related to world history. One student told me it was nice to have a break.

While I was in that class, I spoke to one teen-aged girl who had completed the Analyses form sheets. She was very courteous and helpful, and went through it in detail with me. Her reading was quite poor. "Technician" was technika; "occupation," occupants; and "I don't like being photographed" was transmuted to "I don't like being photography." The discussion with her provided further challenge to some of the assumptions underlying the individualized instruction here. The first step in the Life-Work Analyses was to sort a number of cards showing various activities ("babysitting," "making posters," etc.) into high, medium and low interest groups. Then those choices were entered onto a grid of occupation areas. From this, one could determine his field of high interest, such as "helping," "arranging," etc. When the student pointed out which three areas she had pursued, I was surprised to see that she had chosen two in which she showed only moderate interest. She explained to me that she knew she was not interested in "figuring" because that involved math, even though she had chosen two math activities as being of high interest to her.

In the civics and American history classes I visited, both teachers initially lost control of the class, to the point that there was no instruction going on. In American history one student interrupted the teacher's discussion of Roosevelt's programs for economic recovery with, "May I interject? Who's going to the prom?" The class settled down once I was introduced. The students understood a number of the concepts, though they showed some factual misinformation. One girl knitted throughout the class period. While I was having lunch with the teacher, she said that she didn't like the lack of discipline at the high school, but a relaxed attitude was necessary to keep the school going.

In the class on consumer education (civics), the teacher never got control of the class, possibly because she had moved it to the cafeteria when her room became too warm. When we got there, the twelve students present fanned out over one-third of the room, and about three minutes was spent trying (unsuccessfully) to get them seated in one area. There was a perceptible degree of tension between the three white girls in the class, the teacher and the black students. By far, the most disruptive student was one of the white girls. In at least one instance when a student answered a question correctly ("Can you tell me one ad that appeals to your emotions or feelings?"), the teacher missed it, with the result that the class became confused and subsequent answers somewhat missed the point. I felt this teacher not only had problems in teaching but also in "reading" the people with whom she was interacting. Perhaps this was an exceptional day caused by the first balmy weather.

The law course I attended was superb. The teacher was covering the procedures involved in buying a house and began motivating the students by describing several situations in which the buyer could be "taken." The students were completely absorbed, and appeared to be learning the subject matter.

All the classes doing social sciences that I attended were completely lecture-discussion type, except for a civics class. There, the students also read aloud from their text, Law and the Consumer (Justice in America series). This was done, the teacher informed me, because the students' reading was so poor. One of the girls complained of laryngitis so she would not have to read. In that same class, one girl was not able to calculate 4% of $41. The teacher said she would help her with her math.

One of the first teachers I saw in the morning told me there was a great deal of racial tension in the area. He saw the press intentionally inflaming the situation to sell papers. My feeling was that most of the teachers were successfully handling a very difficult situation and were consciously adjusting their value systems to accommodate the rather different ones of their students.

Not a great deal happened in Rob Walker's life between the time of his Pine City case study and that of his Boston case study. (Hard to believe, considering he spent those four weeks in the cornfields of central Illinois!)

For information about the author, therefore, the reader is referred to the biography included in Booklet VI, "Case Studies in Education: Pine City."